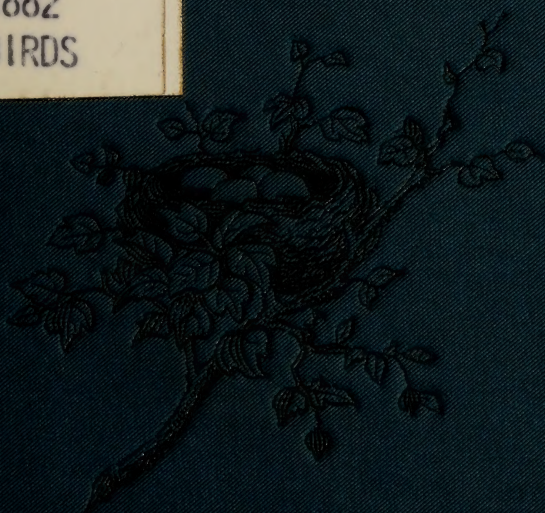


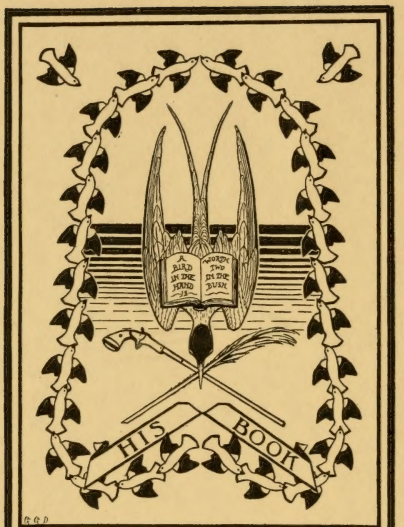
BIRDS:
THEIR NESTS AND EGGS

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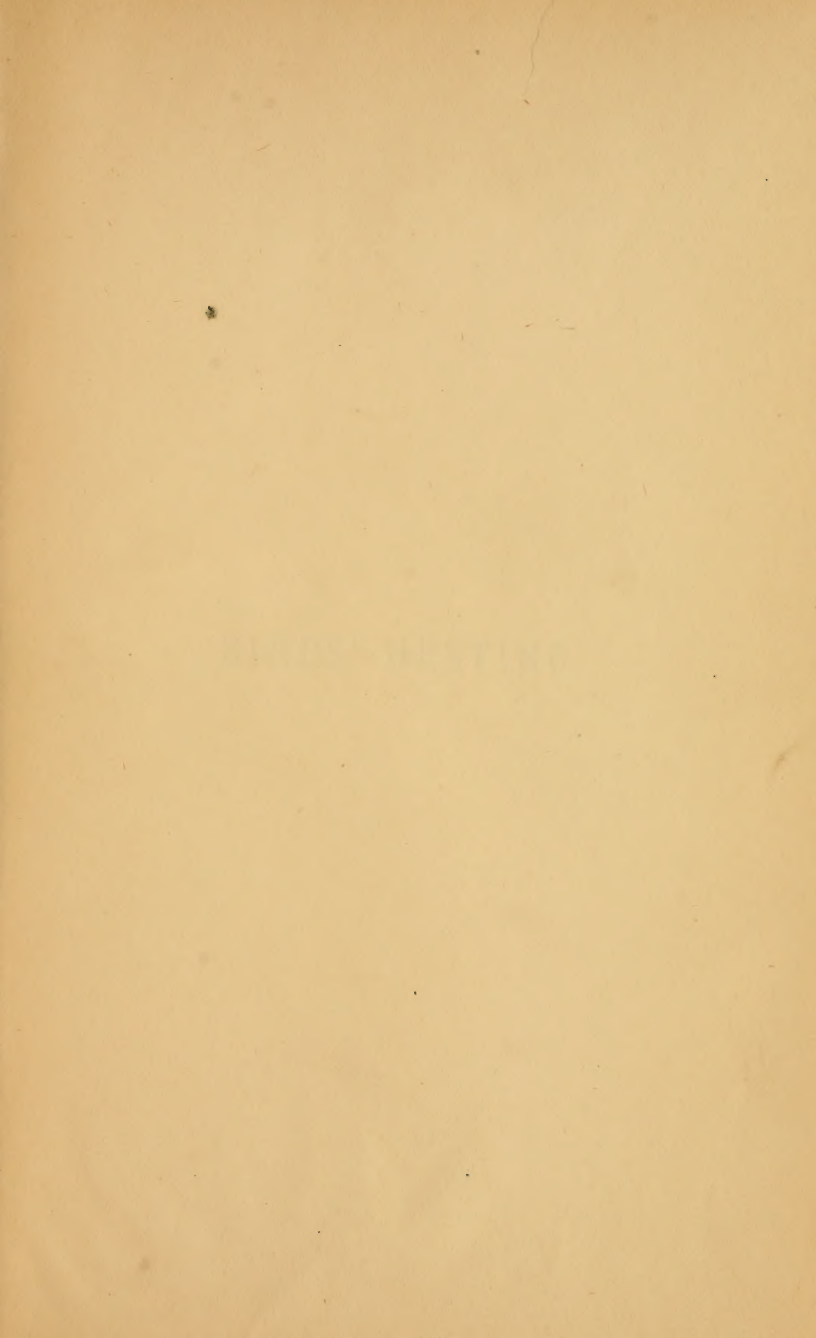
AMERICAN NATURAL HISTORY
* SERIES *



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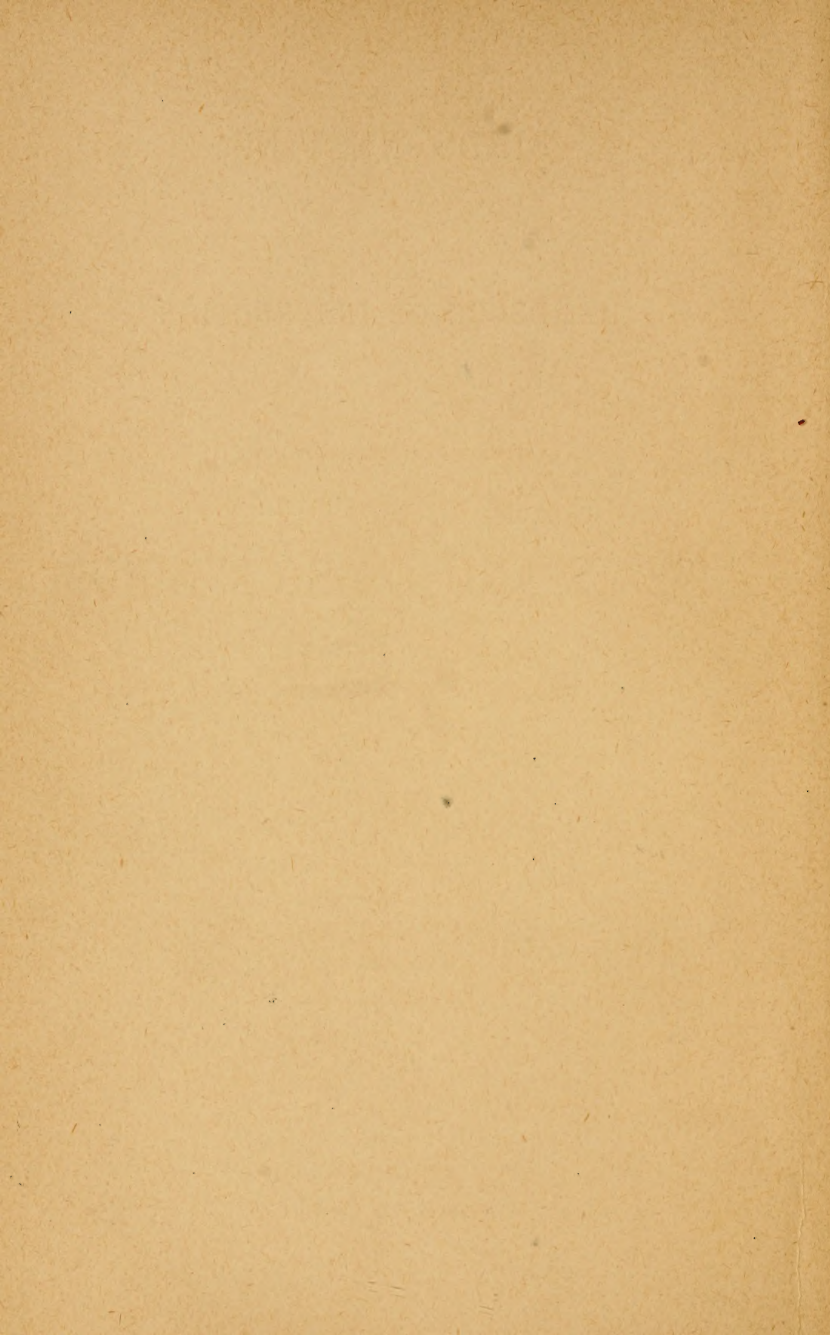
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A

HANDBOOK OF INSTRUCTION

IN

GATHERING AND PRESERVING THE

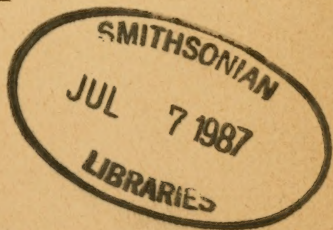
NESTS AND EGGS OF BIRDS

(of the U.S. probably)

FOR THE PURPOSES OF STUDY/

BY

ERNEST INGERSOLL. ^c

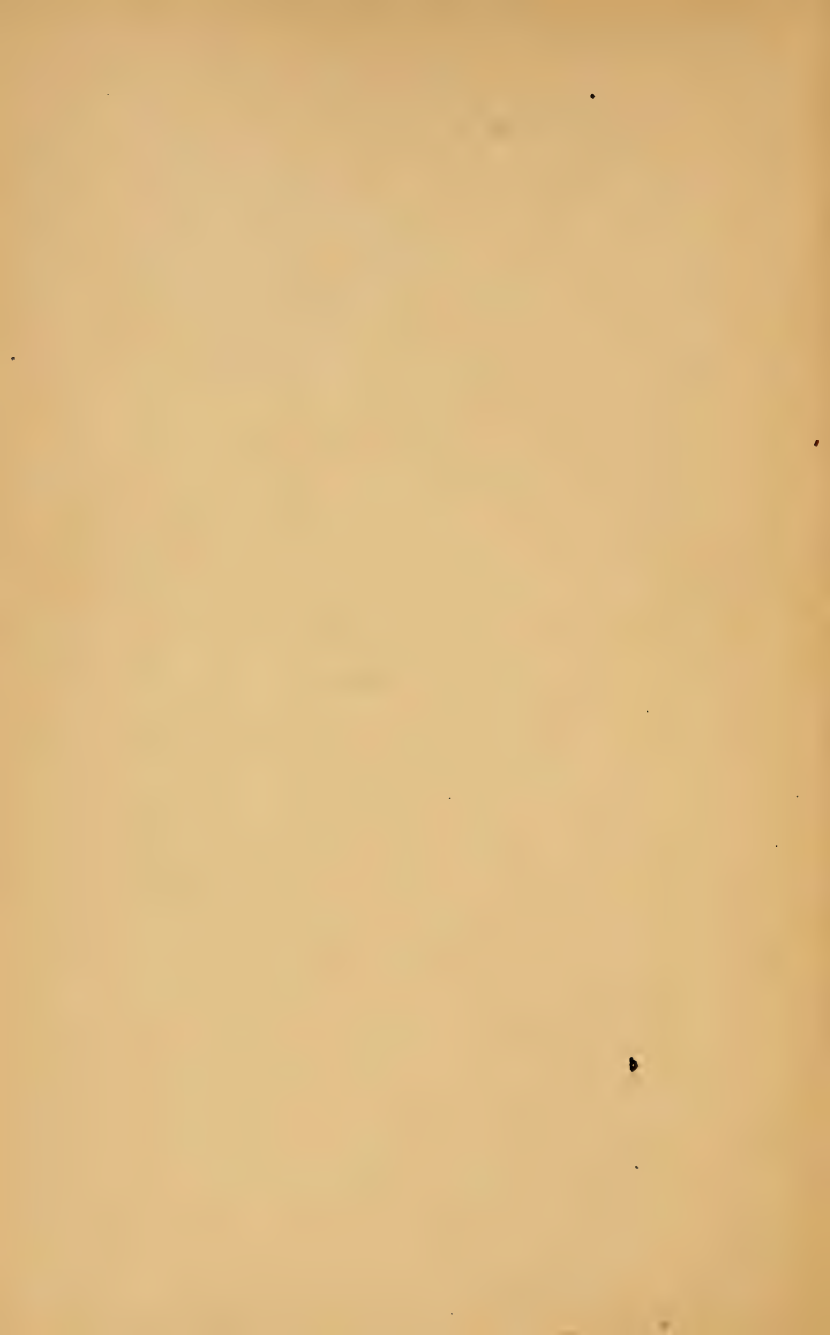


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PREFACE.



P R E F A C E .

THE book herewith offered has grown out of a series of articles printed in the first volume of *Science News*, erstwhile published in New York under the editorial eye of the present writer.

In the course of their expansion the author has not felt himself bound by any hard and fast limits in the treatment of his subject, in respect either to the matters discussed or the manner of discussion. Intermixed with essential information, therefore, will be found a plentiful salting of facts and considerations, which, if not important for their novelty or practical value, may prove suggestive or at least entertaining.

I am well aware that this last word will receive a sniff from some very worthy men,—especially among those whose gravity in things ornithological is far beyond their years,—who preach (and unfortunately practise) that scientific writings should eschew all effort to be readable, improving in proportion to their dulness. Perhaps they would not assert it in phrases quite so cold-blooded, but I do not misstate the tendency.

To me this seems a sad and mischievous view. Science is not the things or facts themselves, but our knowledge of them. This knowledge comes to one or two by personal observation and experiment : to all the rest of us it must come by reading. The observer's object in writing his account of any single fact noted, or series of researches, is, that people may read it, but no one will care to do so if it is not agreeably written, and his object will thus be defeated ; or, if the narrative is perused at all, it will be with fatigue and blunted interest prejudicing the mind most unfavorably.

There are catalogues, analytical descriptions, dictionaries and other mere tools of a student, that are no more intended to be read than a scaffolding is intended to serve as the tower whose fine architecture it helps to rear; these do not require literary interest to add to their usefulness, yet suffer no harm by any chance attractiveness that it may be possible to put upon them. But when it is sought to make every book of natural history either a dry technical tome of reference, forbidding in style of expression and in typographical appearance, or else to make it suffer under the stigma of being untrustworthy simply because attractive to some one beside a closetful of special students, it seems to me time to protest. Give us, say I, the truest, most deeply founded, unchangeable science that can be wrought from Nature's storehouse; but do not deny to us, who are unable to search after the truth for ourselves, some share in the knowledge your better fortune enables you to acquire. Moreover, do not put us off with the plea that we cannot comprehend. What you

know, O wise men, you can tell us if you care to, provided your own thought is clear upon the subject. It is not the depth of the lake which prevents our seeing its bottom, but the obscurities in the water ; yet, on the other hand, because water is muddy is no sign it is deep, nor because a writer is obscure does it follow that his knowledge is too profound for our mental plummets.

I can record such a protest against the refusal of the Brahmins to try to make science popular, more safely here than elsewhere, because no one will maintain, I think, that a book like the present one would be better for being very dry and statistical. Hence I do not feel myself open to the criticism, conceivably sarcastic, of busily defending where I have not been attacked. That a tendency does exist among the pundits to decry efforts at making scientific knowledge widely known and enjoyed, is true ; that it should be argued against and, if needful, laughed at, until abandoned, is the point I wish to make.

If a book like this, guiding the unlearned to the fountain-head of science—nature itself—shall help to break down the artificial barrier between original research and popular information, between study and pleasure, aye, between fact and imagination, I shall feel “that my labor has not been in vain”—words quoted from a humility praiseworthy though quaint.

E. I.

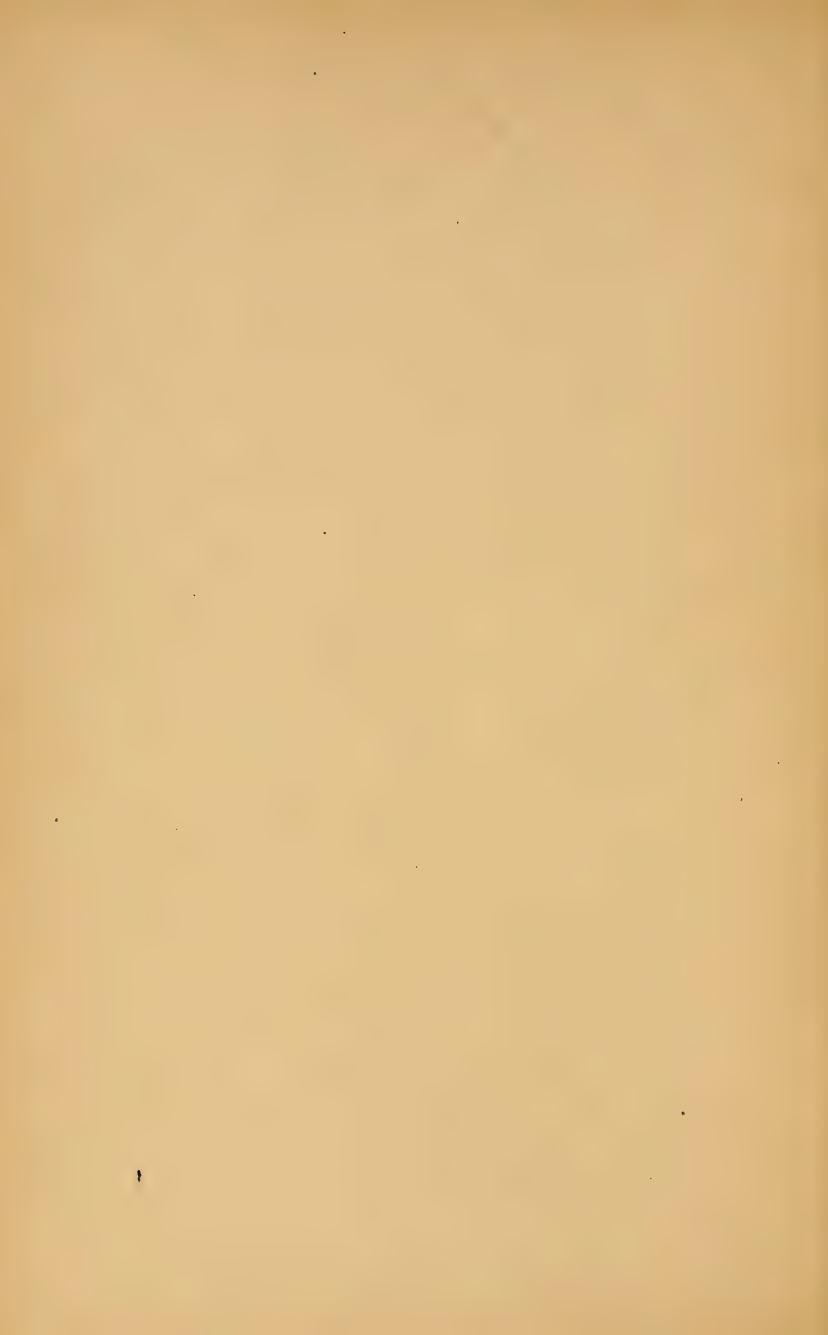
Washington, April, 1882.

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FIELD WORK.



I.

FIELD-WORK.

INTRODUCTORY.

A KNOWLEDGE of the breeding habits of birds being an integral part of ornithology, representing perhaps the most important phase of avian life, collections of birds' nests and eggs are indispensable to the thorough student ; and many persons find peculiar pleasure in forming them.

But the gathering of birds' eggs for scientific purposes,—and I take it as granted that no lesser aim would influence any one,—requires far more discrimination than the collecting of specimens in almost any other branch of natural history. It has been remarked by Professor Newton, in his excellent "Circular" published by the Smithsonian Institution, that the botanist, so long as he gets his specimens in good condition, is satisfied with labels attached giving a few concise particulars of when and where they were obtained ; but the oölogist demands positive

surety that the species of bird to which the eggs belonged was accurately identified, and that the specimens themselves have subsequently been carefully authenticated.

The nests of birds are to be sought for in all localities, and in various months of the year according to the latitude, April, May and June being the most productive. Many of the rapacious birds, however, begin to lay much earlier, even in February and March. Everywhere the lateness or forwardness of the season correspondingly retards or hastens the date of incubation to a considerable degree; and, as a rule, the nesting season on the Pacific coast is several days earlier than on the Atlantic.

If you limit your collecting trips to the immediate vicinity of your home, your observation will tell you when the birds are beginning to build, and when the eggs are to be had. You will discover that, for about a fortnight, if you wish good, fresh specimens, you must work with great zeal, wasting not a single moment. If you delay, the mother birds will begin to sit upon their eggs, the embryos will begin to be formed, and when this has gone on for a few days the preservation of good specimens is very difficult. After the middle of May, therefore, constant vigilance should be exercised, and the eggs of all the earlier breeding birds be taken at once, in order to

make way for the crowd to follow. The services of boys and other persons on farms and plantations may be called in to great advantage at this busy time, in looking up for you the situation of nests; but they should not be allowed to disturb any nest until you, or some other competent person, have visited the spot. This regulation may be difficult to carry out, but will prove most profitable in the construction of a valuable collection, if persisted in.

METHODS OF DISCOVERY.

Where to look for nests may be worth a few words. Most birds build on trees or bushes; many on the ground or on rocks; others in cavities. Some contrive elegant, elaborate structures, endlessly varied in details of form and material; others make no nest whatever. Particular nests, of course, like the birds that build them, can only be found through ornithological knowledge; but general seeking is usually rewarded with a varied assortment. "Search long and diligently," writes one of our collectors. "Place straw, hay, cotton, hemp, or any of the materials that birds use in constructing their nests, in an exposed situation in a swamp or wood; then, by watching the birds when they take it and following them, many nests will be found that would otherwise

escape notice." The same course may be followed in respect to birds observed with nest-material in their beaks, but the process requires great patience, —a virtue every young oölogist should cultivate, and *must possess* in order to do really good work in this branch, which deserves to be ranked as an "exact science."

The best method of becoming possessed of many nests, particularly those of sandpipers and other ground-breeders, is for the collector to conceal himself near the place where he has reason to believe the eggs are, and to endeavor to watch the bird as she returns to her nest, using a telescope, if necessary. Marking where you find nests one season will very likely lead to discovery of others near by, in the next season.

When you are exploring a locality do it thoroughly : peer into every bush, clump of grass, hollow tree and other likely place for a bird's home ; kick stumps and fallen logs to frighten out wrens, nuthatches, etc. ; look in all directions quickly, keeping your eyes wide open and your tongue still,—

"Step softly and speak low."

While some birds, instinctively avoiding exposure, will let you pass close by and make no outcry, others betray their homes at once by their clamorous anxiety,

or try to lure you from the precious structure by feigning a lameness to attract your vain pursuit. All these signs the bird-collector must learn and profit by if he would succeed. The most valuable nests are constantly being brought to light by apparently happy accident; but it is only such good luck as comes to those who are quick-witted, industrious, watchful and unwearied. The secret of success here, as elsewhere, is hard work.

BIRD-PREFERENCES.

One who goes to distant, wild regions to collect eggs of land birds, is generally disappointed. Birds are drawn by various circumstances near to the abodes of man. They seek a place for their homes combining an attractive site, safety from enemies, material for their architecture, and food for themselves and for their fledglings, when the latter shall arrive. The union of these conditions determines a bird's choice of the locality for its home within the area of its general distribution in the breeding season; for, because a species is known to breed both in New England and in Texas, it is by no means certain that its nest will be found everywhere between, even though the species may not be an uncommon one; the case of the cliff swallow (to be alluded to more

particularly in a subsequent chapter) affords an illustration.

One must acquaint himself with the general habits of all the birds, therefore, if he expects to succeed as an oölogist, and in this very necessity—it is well to point out again—lies the value and benefit of the special study at present under consideration. “In the nest the whole life of the bird centres, and hence to write fully of the nest and eggs and nesting habits, is to write very fully and adequately of the birds themselves and of their characters, as these are shown in the choice of places for building, in the structure and surroundings of the nests, in the guardianship of the young, and in the foraging methods adopted by the several species.”

A very important requisite for domestic peace and happiness is security from enemies. This the small birds find most surely near man, and they therefore forsake the depth of the woods and resort to the hedges and groves; to the pasture-lot with its pleasant brook, and thickets of brambles and second-growth saplings; to the roadside and orchard; even to the garden, the farm, or the tree-box prepared for their welcome. Those species that must be sought for in the deep woods and remote valleys are such as are well protected from danger by nesting in holes in trees, or other well concealed positions,

—the titmice and woodpeckers, for example; those which, like the hawks, are able to repel intrusion; and lastly, species naturally exceedingly wild and solitary, as some of the marsh birds: but even these are more likely to be found near our homes than far away,—out in the sunshine, rather than back in the gloom.

NAMING EGGS.

Precision in the identification of his specimens—that is, the ascertaining without any possible mistake the name of the bird that laid the eggs in question,—must be the main object of the egg-collector, to attain which all others must give way. When, therefore, a nest containing eggs, or one newly constructed, is discovered, it should not be disturbed, if possible, before the parents have been taken, or well observed sitting upon it or hovering near, and thus identified. Horsehair snares arranged about a nest, or a daubing of bird-lime, will often secure the parent bird. If the species cannot otherwise be positively determined (and generally in any case), a parent bird should be shot; and either the whole skin be prepared, or a portion—as the head and wing—preserved for identification. The bird may also be thrown into alcohol and thus easily kept. Another method, recommended

as efficacious for a short time (in some cases, for a long period), is not to skin the birds, but simply to pour down their throats, through a small funnel, a few drops of pyroligneous acid, and to saturate the feathers, especially about the vent, with the same fluid; after leaving them to dry for an hour or so, they may be wrapped in paper and packed. This might be a useful plan on rapid and extended trips, when strange species were to be collected and there was not opportunity or skill for preserving the skin; but alcohol about 70 per cent. strong is superior to all other means of preservation of the entire bird, for purposes either of identification or subsequent study.

No pains should be considered too great to secure the certain identification of each set of eggs. If identification be impossible, however, the eggs may still be preserved, as the species can usually be approximated, if not absolutely determined, by an expert oölogist. But such eggs should always be kept separate from the collection until there is no doubt about them, and even then the record should show by whom and in what manner they were named.

CAUTIONARY SUGGESTIONS.

It is often extremely difficult to make an unquestionable determination; as for instance, when many

birds of similar habits breed together. The young collector is especially warned not to be misled by the mere fact of seeing certain birds around a nest. Many of the crow and jay kind are great eaters of eggs, and mistakes have originated from these birds being seen near nests of which certainly they were not the owners. Others, such as the titmice, though not plunderers, obtain their food by incessantly seeking it even in the very localities where many species build. It often happens, also, that two different birds have their homes situated very close to one another; and, if allied species, the collector may easily be deceived.

Professor Alfred Newton relates an instance where a dunlin (*Tringa alpina*) and a purple sandpiper (*Tringa maritima*) had their nests only a few feet apart. At first a pair of the latter only were seen, which by their actions betrayed their uneasiness. A short search discovered a nest with four eggs. The observer was one of the best practical oölogists then living, and his eye at once saw that it was not the nest which he wanted; but a less experienced man would doubtless have immediately concluded that he had found the eggs of the rarer species.

"Indeed it may, generally speaking, be said of most birds, that, whenever they have nests of their own, they are also acquainted with those of their

neighbors, which by their actions they will often betray to the collector who may be patiently watching them." Again, birds, even when not of parasitic nature, like the crow blackbird, will occasionally lay their eggs—accidentally, as it were—in the nests of other species; thus eggs of the eider-duck have been found in the nest of a gull; other similar cases are on record, in some of which, from the species being nearly allied, confusion might easily have arisen, though at the time no doubt may have occurred in the collector's mind. That it is easy to be mistaken is shown by the slips made even by that great oölogist, Dr. T. M. Brewer, when at the height of his experience;—for example, in publishing accounts of the nidification of *Phænopepla nitens* as that of *Myiadestes townsendii*, and in one or two other instances recorded occurring in his North American Oölogy.

OVERCOMING DIFFICULTIES.

It is not always easy to obtain the nest or eggs, in good shape, even after you know where they are. Sometimes, indeed, it is all but impossible, and attended with great danger; a consideration, however, not likely to deter any ardent naturalist from attempting to enrich his collection.

A large number of sea-birds, and many birds of

prey, make their homes in holes or niches on the vertical faces of cliffs. As a rule, these crags overhang the surf, or some frightful depth of mountain chasm, and are totally inaccessible from below. In some cases, like that of the East Indian edible swallow and several arctic birds, caves in the faces of lofty seaward cliffs are occupied. Then the problem of how to get at their homes is rendered doubly difficult, and its solving extremely perilous.

If there are no means of climbing up to such nests, of course the only way is to be let down. Boyish enthusiasm leaps at this prospect, as savoring of a daring not unmingled with nerve and skill very attractive to the imagination, and thus wise precautions of safety are often omitted. No person, for instance, ought ever to attempt to go over a cliff alone, yet it has been done; nor should any one allow himself to be lowered without being so secured to the noose or seat in which he rests at the end of the rope, that, should any accident deprive him of his strength or self-control, he would not fall from his seat. Sudden and unaccountable dizziness sometimes attacks the hardest and most experienced heads, due to some peculiar, unsuspected state of the nervous system. A very small pebble falling a long distance and striking the head of the bird's-nester might easily produce insensibility, and there is always danger of

even larger rocks falling. Numberless possibilities of loss of self-control exist in the situation, and it is well to be lashed to the seat in such a way that your friend at the top can haul you up dead or alive in case of accident.

The most serious peril attaching to this hazardous part of oölogical work, however, is that the rope is

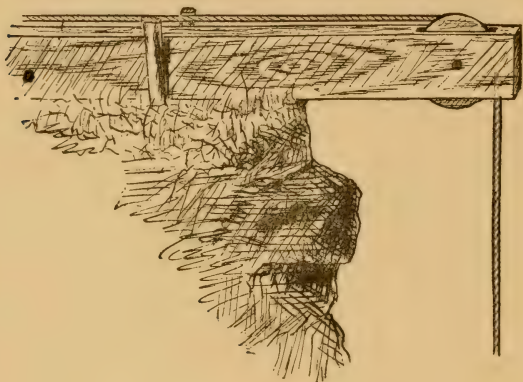


FIG. 1.

liable to break. Common sense would dictate that you make sure it can bear your weight ; nor does the trouble usually lie here, but in the fact that the chafing of the taut line over the rocks at the edge of the cliff slowly cuts the threads, till an extra strain occurs, the last strand parts, and the unfortunate sportsman is dashed to a horrible death below. Such a fatal result of

honest scientific endeavor can always or nearly always be avoided.

It would not be a very difficult matter, usually, to rig a large pulley at the edge of the cliff, through which the rope may run securely. One could be constructed for the purpose, surmounting an iron pin to be driven into the soil, or wedged in a crevice,

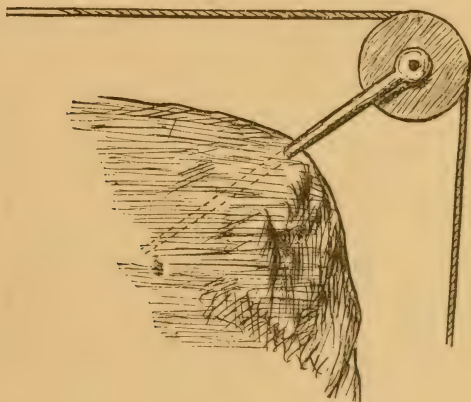


FIG. 2.

at the summit of the cliff. Another plan would be to insert the pulley into the end of a strong beam, which should be allowed to project a few inches beyond the brow of the cliff, its opposite end being firmly anchored by some simple means. Of course, the utmost care must be taken to secure

this machinery strongly to the cliff, since if it breaks evil consequences are likely to ensue.

These are instruments that may be hastily constructed, and capable of being carried on a collecting tour, without much trouble. Where the trial is to be made near home, however, and circumstances will admit, the planting of a suitable windlass at a little distance back from the edge of the cliff, with two men to handle it, and the placing of a stout roller at the brink, over which the rope shall pass without danger of abrasion, are recommended. This may seem like elaborate machinery, but the value of specimens that can only thus be obtained justifies the expense. Besides this, where so precious and irrecoverable a thing as human life is risked, too great caution for insurance against harm cannot be taken.

I have urged these various precautions strongly, because I can well sympathize with the eagerness and almost reckless self-confidence of a young egg-seeker who sees a prize just below him; and I also know, better than many, the unseen risks he encounters.

In going down, some preparation to carry your eggs, better than in your folded handkerchief, is well. Probably the best contrivance is a trout-creel, strapped to the *belt* (not hung over the shoulder) the interior of which has been suitably arranged in

compartments, or with movable boxes for the easy reception and safe carriage of the eggs. In many cases, particularly when the nests of cliff-building hawks and eagles are the object, a stick or knife should be taken as a weapon against the attacks of the infuriated owners. There is so small an extent of the coast of the United States, at least upon the Atlantic border, where steep and lofty cliffs occur, however, that instruction in the work, either of scaling or descending them is somewhat superfluous in the education of the American ornithologist. In England and Scotland, on the contrary, every naturalist needs and obtains much of this knowledge and experience.

A few words in regard to climbing trees, and securing nests and eggs from inconvenient positions may not come amiss. I agree with a late newspaper paragraph on this point, when it condemns climbing-irons; "the feet get cramped and tired out, the legs become stiffened with pain, and the shock to the system occasioned by climbing is made doubly worse by the use of the irons. Never attempt to use them on a hard-seasoned tree without bark, nor a limbless tree that you cannot reach around; if you do, ten to one you will land on the ground below before any great height is gained. Unless your nerves are strong, never look down, nor higher up than is

necessary to take one step above another; keep the eyes familiar with all objects on a level with them, which will make it seem that you are on the ground. Take off the coat, or wear a short coat without arms: this will in a measure protect the lungs from being strained, and from other injuries."

THE ASCENT OF HIGH TREES.

How to ascend tall, limbless trees is a problem which circumstances generally help to solve more than any guidance I could give. It is possible to make a ladder out of the trunk by nailing slats across, or by driving in heavy spikes, but this usually makes needful a special trip, and not every case is worth the trouble. A rope-ladder would be a good thing, if, first, you could get it attached; and if, secondly, you could loosen it, when you were finished. A western man writes that he pursues the following somewhat laborious plan. I have never seen it in operation, but should think it would do well, if your own head was level, your friend's arm stout, and the rope sure not to be chafed in two where it runs over the rough limb. He says:

"In collecting nests I always have some person along to assist me, and when after hawks' nests carry the following outfit: a stiff bow and half a dozen

long arrows with heavy lead heads, a ball of stout linen cord one hundred and fifty feet long, and a rope of the same length and one inch in diameter. Having found a nest, shoot an arrow with the cord attached to the shaft over the limb close to the nest, then pull over the rope, make a loop in one end and seat yourself securely in it. With the assistance of your friend you can easily draw yourself up to the nest. When you reach it (for you need both hands in removing the nest), let the person assisting you take a turn with the rope around the trunk of the tree ; in this way he can hold you securely without danger of letting you fall."

The plain objection to this is its cumbersomeness and general impracticability. One hundred and fifty feet of three-inch rope would weigh between forty and fifty pounds. A man would not want to carry this a great distance on a warm spring day, in addition to the other apparatus mentioned and his lunch, which the writer forgot to include in his list, but would doubtless remember in actual experience. If it is replied that the proper way is to take the cable and the rest of it in a wagon ; then I suggest that the collector might as well at once provide himself with a fire-escape, or a series of pyramidal extension ladders which could be set up underneath the nest

and by means of which he could mount to his prize most advantageously.

Another western man thinks the quickest means of ascending such trees is by the use of a rope about an inch and a half in diameter and six or seven feet long. Pass this rope around the tree and your body, and tie it so that you fit nicely between; push the rope up with you, keeping it about the middle of the body. When you wish to rest, push the rope up as far as possible on the opposite side of the tree and sit on it. This process may work successfully in some cases, but I should recommend the novice to practise it thoroughly near the ground before attempting loftier flights.

It frequently happens that nests are out upon the ends of branches that will not bear a man's or boy's weight, and hence must be got at in some other way: If such a limb is a small one, it can readily be sawed off and held by the hand. I used to wear a belt-knife (which, as I have already said, is exceedingly useful in collecting), the back of which was notched into a saw for such emergencies. Such a tool can be made easily, if it is not purchasable. In the case of larger limbs, they may be prevented from falling when sawed through, by having a rope attached to them and passed over a strong limb above, so as to sustain their weight.

Another plan, in the case of long, dangerously weak branches, is to tie a rope securely under your arms, and attach it firmly to the trunk at the right height above you. You can then crawl out upon the shaky limb and take the chances of its breaking, assured that the rope will save you from falling very seriously. This sort of thing should be a last resort, nevertheless.

THE SCOOP-NET AND MIRROR.

A young ornithologist at Westerly, R. I., has devised an ingenious method of securing eggs from nests at the extremities of limbs, and other inaccessible places, where the nests are not wanted. It was suggested by his desire to obtain woodpeckers' eggs where he could not reach down into the burrow and was not allowed to cut into the tree, as one can sometimes do in wild land. To overcome the difficulty he took a piece of steel-spring wire, brought the extremities together, and inserted them into the split end of a handle, about the size of a lead-pencil, which is scarfed at that end. A little muslin bag is then fitted to the wire, forming a scoop-net. When not in use the wire and bag are rolled around the handle and confined by a metal cap, for which purpose a pistol-cartridge shell answers very well, and can easily be carried in the vest-pocket. When the

instrument is to be used it is fastened to the end of a straight stick of suitable length. "I have obtained eggs in this way," says the inventor, "at a depth of four feet, and often taken them out of a nest on the end of a limb too frail to support weight nearer than within six feet of the nest." Some such little scoop or dipper would be excellent in cliff-work, also, I should think, but I must confess to a lack of experience in that kind of collecting.

Another little device worth mention is this: when you are uncertain whether a nest, the interior of which is overhead and out of sight, contains eggs or not, you can often save time and an expenditure of strength in climbing by the use of a mirror. Take one of the little round looking-glasses, which are framed in thin metal with a hinged cover and designed for the vest-pocket, or make some similar substitute for yourself, and fasten it to a ferrule at right angles to its surface. When it is to be used, slip the ferrule on the end of a pole of suitable length, and hold the mirror up over the nest; if there are eggs or young there, it will at once be apparent in its face. A perfection of this instrument would be the connection of the glass and the ferrule (which latter should be strong) by an universal joint or swivel-arrangement, with a proper clamp, so that the mirror could be set at any desired angle. Any

clever mechanic ought to construct this little machine at small trouble and expense.

MANY SPECIMENS DESIRABLE.

Sometimes by removing all the eggs in a nest except one or two, without handling those left, a large number can be obtained from one pair of birds ; often, however, the nest will be found abandoned on a second visit, and in some cases, all the eggs destroyed or removed. It is well, therefore, particularly if at a distance from home, to take all the eggs at once, and the nest along with them, if you need it ; nor, if you propose to make a close study of oölogy, will a single set, or, sometimes, even a dozen sets, suffice to show extremes of variation.

A PLEA FOR THE STUDY OF THE NESTS.

Whether or not it is worth while to collect nests—for there are many persons who never do so—is, it seems to me, only a question of room in the cabinet. As a scientific study there is far more advantage to be obtained from a series of nests than from a series of eggs. The nest is something with which the will and energies of the bird are concerned. It expresses the character of the workman ; is to a certain extent an index of its rank among birds,—for in general

those of the highest organization are the best architects,—and gives us a glimpse of the bird's mind and power to understand and adapt itself to changed conditions of life. Over the shape or ornamentation of an egg, the bird has no control, being no more able to govern the matter than it can the growth of its beak. There is as much difference to me, in the interest inspired, between the nest and the egg of a bird, as between its brain and its skull,—using the word *brain* to mean the seat of intellect. The nest is always more or less the result of conscious planning and intelligent work, even though it does follow a hereditary habit in its style; while the egg is an automatic production, varying, if at all, only as the whole organization of the bird undergoes change. Don't neglect the nests then. In them more than anywhere else lies the key to the mind and thoughts of a bird,—the spirit which inhabits that beautiful frame and bubbles out of that golden mouth. And is it not this inner life,—this human significance in bird-nature,—this *soul* of ornithology, that we are all aiming to discover?

Nests are beautiful, too. What can surpass the delicacy of the hummingbird's home, glued to the surface of a mossy branch, or nestling in the warped point of a pendent leaf; the vireo's silken hammock; the oriole's gracefully swaying purse; the black-

bird's model basket in the flags ; the snug little caves of the marsh-wrens ; the hermitage-huts of the sly wagtails and ground-warblers ; the stout fortresses of sociable swallows !

Moreover, there is much that is highly interesting which remains to be learned about nests, and which can only be known by paying close attention to these most artistic masterpieces of animal art. We want to know by what sort of skill the many nests are woven together, that we find it so hard even to disentangle ; we want to know how long they are in being built ; whether there is any particular choice in respect to location ; whether, it be a rule, as is supposed, that the female bird is the architect to the exclusion of her mate's efforts, further than his supplying a part of the materials. Many such points remain to be cleared up. Then there is the question of variation and its extent in the architecture of the same species in different quarters of its ranging area. How far is this carried, and how many varieties can be recorded from a single district, where the same list of materials is open to all the birds equally ? Variation shows individual opinion or taste among the builders as to the suitability of this and that sort of timber or furniture for their dwellings, and observations upon it thus increase our acquaintance

with the scope of ideas and habits characteristic of each species of bird.

VARIABLE ARCHITECTURE.

As an example of this discriminative phase of bird-architecture, I may mention the remarkable history of Traill's flycatcher (*Empidonax trailli*) which, in the typical form or as its "variety," ranges nearly across the continent in the breeding season, through the northern half of the United States and the contiguous parts of Canada.

The nest of this species is not to be looked for in the high dry woods which its close cousin, *E. acadicus*, loves, but in low, wet and brushy places; it makes its home in bushes rather than in trees. The style of the nest, moreover, is totally unlike that of the Acadian species, resembling more nearly the work of the summer warbler (*Dendræca æstiva*), but lacking the compactness and neatness with which that species weaves together the materials that make up its home. Hempen fibres compose the exterior, or body, of the nest, while internally it is lined in true flycatcher style with fine grasses, and a slight admixture of down from thistles; the main point of all characterizing it, however, is its position with regard

to the branches. "It is built into an *upright* fork, the small twigs that surround it being made available to secure it more firmly in its place by being encircled with the stringy fibres. In this particular of position correspond all of the nests of this bird I have seen, as well as those of *pusillus* in the west."

Such, in brief, is the account given of the typical nidification of *Empidonax trailli* the country over, by its latest monographer. But some additional explanation is necessary to get at a full knowledge of this mutable bird.

For instance, criticising the above account by Henshaw, so far as it applied to Maine, Mr. H. A. Purdie writes in a succeeding number of the Bulletin of the Nuttall Ornithological Club, that in New England the nest of Traill's flycatcher is "placed between the upright shoots of low bushes from one to five feet from the ground, and is loosely constructed of grasses throughout, including the lining; it is a much less compact nest even than that of the indigo-bird, though perhaps smaller in the average." Further on Mr. Purdie says: "I have lately seen nests and eggs of both *E. acadicus* and *E. trailli* collected at Columbus, Ohio, by Dr. J. M. Wheaton. Singularly enough, that of the former (*E. acadicus*) bears a close resemblance in its structure to that of Maine specimens of Traill's flycatcher, while the compact, felted character

of the latter, *E. trailli*, is entirely unlike any nest of this species from the Canadian Fauna." Nests in Mr. H. B. Bailey's collection from Dakota are like those of the olive-sided flycatcher, built of rootlets near the ground; while, to crown the diversity, Pearsall found a nest of this species near Bayside, L. I., June 24, which was suspended in a horizontal fork and made of scanty fibrous grasses, like the nest of the *E. acadicus* in all particulars.

In the far west we find that an equal diversity obtains. Ridgway, for example, took two nests in Parley's Park, Utah, one of which was loose and partly pensile, the other compact and supported in the crotch of a brier-bush. Finally there remains to be mentioned, as occurring on the middle line between the species and the variety, a remarkable home of this flycatcher met with, on June 28, by Mr. Ludwig Kumlien, in Jefferson county, Wisconsin, of which Dr. Brewer gives particulars. This nest was placed in a thick mass of coarse marsh grasses, near the ground, on the edge of Lake Koshkonong, and was firmly interwoven with the tops of the surrounding herbage. The grass and reeds, among which it was made, grew in the midst of water, and it was discovered by accident in a hunt for rails' eggs. "It is a large nest for the bird; its base and sides are made of masses of soft lichens and mosses, and within this

a neat and firm nest is woven of bits of wool and fine wiry stems of grasses, and lined with the same."

Now all this interesting and instructive diversity, and hence an extremely important part of the bird's life-history, would have been lost had not the nests, as well as the eggs, been collected and studied. I wish to impress strongly upon all readers the value of close, accurate and repeated notes upon the dwelling-houses of the birds.

But the nests may not always be movable.

In such unfortunate cases, full mention of the date, position, structure, *et cætera*, should be carefully jotted down in the field note-book, and perhaps a little sketch made of appearance and position. Such memoranda and sketches will prove of immense value later, when you want to study up the architecture of that species of bird.

PRESERVATION OF THE NESTS.

Nests constructed on bushes, or in trees, generally need only slight precautions to insure safe removal and preservation for immediate carriage. They should never be torn from their fastenings; but the branch upon which they rest, or the twigs to which they are attached, ought to be cut off; for which purpose it will be found convenient to carry, in a belt-sheath, a

large knife having the back notched into a saw. The observations in regard to obtaining eggs from difficult positions, detailed on page 17, will of course apply here equally well, and need not be repeated. Nests that rest on the ground often require to be secured against dropping to pieces by a little judicious wrapping, or tying together, or even by a few coarse stitches with a needle and thread; while those built of mud, like the swallow's and the phœbe's, will crumble, more or less, unless each one is fitted into a pretty tight box, and not handled afterward.

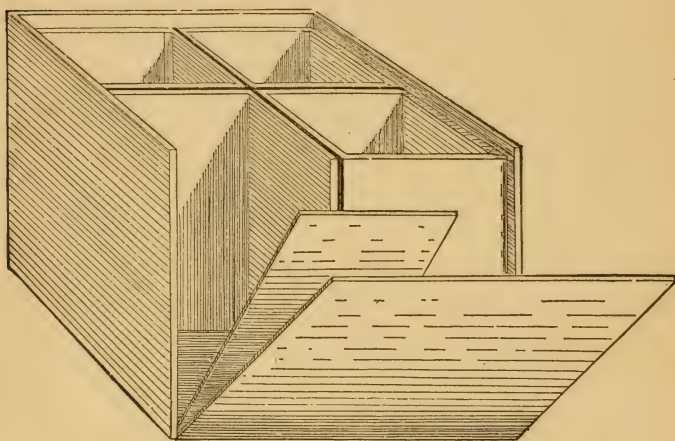
And here let me put down something which I neglected to mention before, when describing methods of search for the nests of birds wily in concealing their homes and pearly treasures. One of the most difficult classes of birds' nests to lay one's hands upon is that of the ground-builders. These nests are not only concealed among the grass of the meadows, but perhaps amid the tall stems of growing grain; and even if you flush the parent by walking through the fields, you cannot always trace it to its home, since with cunning caution it has run to a little distance from the object of its anxious hiding before starting up.

To aid in finding such nests, I have heard of the following plan being adopted: Two persons take a long rope of sufficient weight to drag well upon the

ground, and stretch it out to its full length. Holding opposite ends, they then walk slowly abreast from one side of the meadow to the other, dragging the rope stretched between them, and steadily keeping an eye along its line. When, as soon will be likely to happen, a sparrow, bobolink, meadow-lark, or some other ground-breeder starts up between them, alarmed by the rope, they drop the line and follow its guidance to where the bird was flushed. In a large proportion of cases a desirable nest will be found among the grass-roots at that very point. Such a process will save many steps, and is certainly worth remembering.

Mr. William Brewster, of Cambridge, has an exceedingly good method of preserving nests, thinking it desirable to keep all of them that he can accommodate. He has had made a series of deep, square, pasteboard boxes, of different sizes, but the larger multiples of the smaller, so that two or four little ones will fit accurately into a big one. One side of each box, however, is made to let down, being attached only at the bottom, by a cloth hinge. After a nest is put in a suitable box, therefore, it is not necessary to lift it out to look at it, for you can let down the side of the box (held upright at other times by a rubber band), when the top and one side of the nest will be open for examination without the

least handling. In the case of the smaller nests, whenever three or four specimens belonging to the same species are secured, the little boxes which they occupy are set inside of a larger box, and the whole series is thus kept together without loss of room. This is a very advantageous arrangement.



THE BREWSTER NEST-BOX.

PURIFICATION OF SPECIMENS.

Before packing nests, it is always well to be quite sure that they are free from insects or decaying matter. Various methods of fumigation can be employed to avoid unpleasant odors, the increase of vermin or other harm. One way is to inclose the nest in vapor of carbolic acid or other disinfectant,

by placing it in a box perforated with a few pin-holes, accompanied by a small sponge well saturated with the liquid. Instead of carbolic acid, hyposulphite of soda, a colorless and inoffensive solution, might be used. Chlorine-water may also be recommended. Dry disinfection is secured by blowing the nest full of Persian insect-powder by the help of a bellows; after remaining a few hours the powder can be blown out in the same way. It would be possible to use powdered chloride of lime for the same purpose, but this is less desirable; one objection being that this powder (and equally the chlorine-water spoken of above) might bleach the color out of some components of the nest. Other means of purifying your prizes for the cabinet, where necessary, will suggest themselves.

CARE OF EGGS IN THE FIELD.

Having secured your nests, if you think the eggs are fresh—and their appearance will often tell—a good plan is to remove the contents of the eggs right there, since they can be carried with far greater safety when empty. If you think there are embryos in them, however, do not try to do this. Wrap each egg in cotton, and pack it in the nest. Inclose the nest in a box, tie it up, put it in your basket and do not forget it is there, else you may find everything ruined

by a careless jar or tumble. For this work a trout-basket is first-rate, since you can conveniently suspend it by a strap over the shoulder, leaving your hands free. At one time I was accustomed to wear a soldier's cartridge-box attached to my belt. This was not cumbersome, and served fairly when filled with empty shells carefully ensconced in cotton; but I could never trust it to carry unblown eggs in safety. It would prove a very handy receptacle however, for note-book, instruments, etc., and would not be in one's way in climbing or making a path through thickets and the other obstacles an enthusiastic and often heedless egg-hunter is pretty likely to encounter in his pursuit. If you carry the eggs without the nest, wrap each one carefully in cotton, wrap the cotton in soft paper, put them in a shallow tin box, with plenty of cotton between, and fasten the cover of the box tightly, which may then be placed in the pocket or basket.



PREPARATION OF SPECIMENS.



II.

SPECIMENS.

UPON every egg, as soon as taken, and upon the nest also, should be put a temporary number, in soft lead pencil, referring to your Field-book, which never, *never*, be without. This will save any confusion from forgetfulness, or any other cause, of which there is always danger; when you get home your notes can be transferred in proper shape to your Ledger, the pencil-mark washed off from the egg, and permanent marks put in its place.

The field-record, made on the spot, before another nest is collected, is of the greatest importance. It is not safe to trust for an hour to memory alone.

I ought to caution the beginner, however, that he must erase pencil-marks, or otherwise touch the surface of an egg, only when absolutely needful and then with the utmost care; since there are few eggs that will not suffer great harm by any such treatment.

The next thing is the proper preparation of your

eggs for the cabinet. The old way used simply to be to break a small hole in each end, blow out the contents, and string the eggs, like beads, on pieces of ribbon, which were hung up to adorn the wide empty fire-place in winter with gay festoons. But we have come to think, nowadays, that it is scarcely less than wicked to deprive the birds of their eggs for no better use than this: at least I am writing this book for those only who have a higher aim in making a collection and a better ultimate use for it than this.

If two holes are to be made at all, and generally one will suffice, let them never be bored at the apices of the egg, but at a little distance from each end, and both on the same side, choosing the side least conspicuously marked. A blow-pipe applied to the smaller hole will then force out the contents at the other slightly larger one; but this is the least desirable plan.

The best, and therefore the proper, way to empty eggs is through a single hole in the plainest side. This hole, of course, should be proportioned to the size of the egg, and the amount of incubation it has undergone. It should be circular with smooth edges. The tools with which this is best accomplished are steel drills, which may be procured at the naturalists' shops, at a dentist's, or may be made to order.

The drills are of three sizes. Number one is meant

for the smallest eggs—even of hummingbirds—and up to warblers, sparrows and those say of a thrush. The grooves forming the drilled surface should be cut with a *chisel*. The second size will suit the generality of eggs, excepting those of very large birds and of sea-fowl, which usually lay eggs with a strong



FIG. 3.

but soft shell. The grooves may be cut either with a chisel or a file, but if with the latter, greater care will be requisite in its use. A third size is intended for the largest eggs, and even some of the smaller ones which have a chalky shell, such as *Crotophaga*.

The grooves are cut with a *file*; in the manufacture of all these drills the greatest care is necessary that

the grooves should lie *parallel to one another*, and that their *edges should be smooth*. The smaller the drill, the more acute should be the angle it forms at the point. The drills may be fitted with handles or not, according to fancy,—those with handles being less likely than the others to cramp the fingers of the performer, an inconvenience which often causes breakages. Collectors not having such drills will find a common nail or a three-cornered needle a useful substitute, but either of these must be used with extreme care.

Holding the egg gently but steadily in the fingers, apply the point of the drill perpendicularly to the surface, unless it be preferred to prick with a needle first. A twirling motion of the instrument, by filing away the shell gradually, enlarges the opening, which should be no larger than is required to accommodate the blow-pipe loosely, leaving room for the egg's contents to escape around it. In very small eggs, like those of the warblers, when fresh, this hole need not be larger than a pin would make, and thus it will be scarcely visible.

The hole having been drilled, hold the egg in the left hand, hole downward, nearly (sometimes fully) insert the small end of the blow-pipe, and blow equably and continuously, until all the contents are expelled. The pressure of air must be, though

steady, a very, very gentle one ; a strong puff easily bursts a delicate egg. A suitably bent wire should be provided for cleaning the blow-pipe, which should also be kept corked at both ends, when not in use, to prevent its becoming clogged with dust.

Blow-pipes are best made of nickel, and the bent form is more convenient, and hence safer and better, than the straight. They should be as light as possible, smooth on the outside toward the point, and the orifice should be as large as the diameter of the tube will permit. Two sizes are recommended, since a small pipe, suitable for little eggs, causes loss of time in blowing large ones ; for eggs as big as a gull's, a common jeweller's blow-pipe will answer very well.

Experience will teach one how he may empty the smaller eggs without quite inserting the blow-pipe, and with greater safety. A good plan sometimes is to force water into the egg through the pipe.

PERFECTING THE PROCESS.

After all the contents of the egg have been removed, rinse the shell thoroughly and dry it at once. The rinsing and drying are both important, and should be done carefully. For the latter purpose do not use a layer of sand or meal, since, in absorbing the moisture, these substances are likely to

"cake" about the hole in the egg, becoming so firmly attached that one can hardly remove the particles without marring or breaking the shell. A better plan is to set the eggs, after rinsing, hole downwards, on a blotting-pad. But an improvement on this, again, has been suggested in the substitution of a soft, folded towel for the blotting-paper. This not only absorbs the drainage of the eggs, but on its yielding surface you can roll them about gently, so as to dry every portion of the outside without rubbing, which is likely not only to destroy the "bloom" of



FIG. 4.

an egg, but even to rub off the colors, when freshly laid, as previously mentioned.

In all cases, set the eggs that have been lately collected aside in a dark place for a few days before putting them into the cabinet.

The contents of some eggs may frequently be removed best by aid of a syringe, which is also very useful for purposes of rinsing; this, too, should be made of nickel. The ring at the top should be large enough to admit the thumb, for the instrument must be worked with the right hand, while the operator holds the egg in the left. It frequently happens that

for various reasons a person may find suction a better way for emptying an egg than expulsion. As an aid to this a thin glass pipe with a bulb has been devised. The object of the bulb is to prevent the fluids from reaching the mouth. The lower orifice should be as large as possible, and, like the blow-pipe and syringe, perfectly smooth on the outside.

If, from any reason, you cannot procure these instruments, do not hesitate to begin without them; and, after all, as an experienced and successful col-

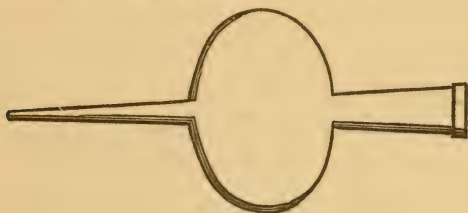


FIG. 5.

lector remarked lately, "there's nothing like one's jaws." The most important of them all, next to a proper instrument for boring the hole, is the blow-pipe, and if this cannot be got of the shape desired in nickel, it may readily be made out of glass-tubing, one end of which can be melted in the flame of a gas burner or spirit-lamp and drawn out to a fine, smooth point, after which the tube be warmed enough to be bent at right angles or into any other shape. Some indeed prefer such a home-made blow-pipe of glass to any metal one.

Your ingenuity will thus invent substitutes for regular tools. Scores of times I have sat down under the tree where I have found a bird's nest, and blown the eggs nicely, with no better instruments than a buckskin needle and a hollow stem of ripe grass—the latter making a very good blow-pipe, since it is exceedingly light; while if your metal pipe drops from your lips, the chances are that your egg is demolished. Small fresh eggs, I, myself, do not object to sucking directly, lying on my back, and letting the egg rest cushioned between my lips, guarding it with care against contact with the teeth. Whatever bad taste remains in the mouth is quickly got rid of by a morsel of candy or spice, which can be carried in the pocket for this purpose; or aromatic herbs, like peppermint or the pungent barks of spicewood and birch, are easily found, and effectually obliterate the memory of the raw yolk.

TREATMENT OF INCUBATED EGGS.

My remarks, so far, have applied to fresh eggs, in the manipulation of which the young collector will soon become proficient; but eggs which contain embryos present some difficulties, and require the help of certain instruments to empty and preserve properly.

When it is known that incubation is much advanced, I should recommend that generally the parent-birds be left to finish their labor of love; yet if the eggs are rarities greatly needed in the collection, it may be profitable to take them. Eggs long sat upon are more easily blown by being kept a few days, but the operation must not be deferred too

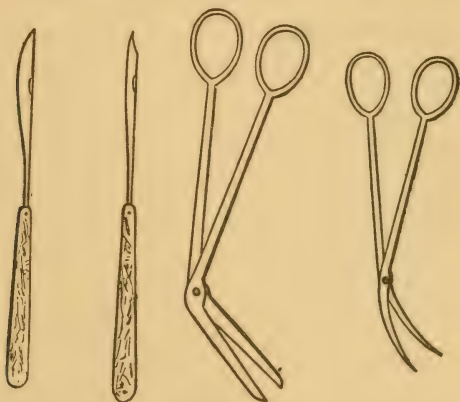


FIG. 6.

long, or they may burst violently immediately on being punctured, unless held under water while the first incision is made. When the embryo is well grown, the hole may be drilled as before, but it must be larger; and as the drill is likely to split a shell after it has bored a certain size of hole, it is often well, with a fine needle, to prick a circular series of minute holes, almost touching, and then remove the

enclosed circle of shell. This must be done with great caution, for egg-shells grow more brittle toward the time of hatching. The hole being drilled, the lining membrane should be cleared away from the orifice with a penknife. Well-formed embryos cannot be got through any hole that can be made in the shell, and it must not be tried—there is every probability of ruining the specimen; they must be extracted piece-meal. First, a stream of water should be introduced by means of a syringe, and the egg then gently shaken, after which the blow-pipe may again be resorted to, until by the ultimate use of both instruments, aided by miniature scissors, hooks, knives and forceps, the embryo is cut to pieces and completely removed.

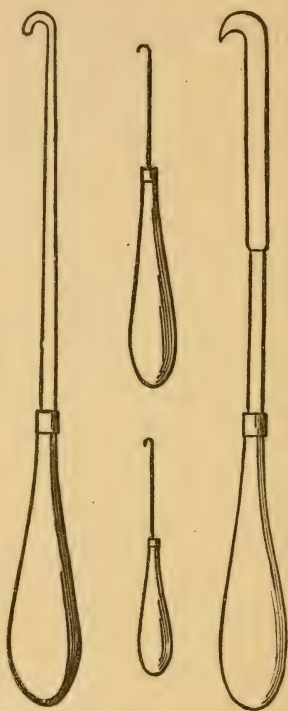


FIG. 7.

Some types of the forms of these miniature oösur-gical instruments, as I may be pardoned for calling

them, are shown in the accompanying figures (6 to 8), taken by permission of Prof. S. F. Baird from the Smithsonian "Circular." If they cannot be readily purchased, a clever mechanic ought to be able to make them or their substitutes.

I am able to give, also, a figure of a queer pair of

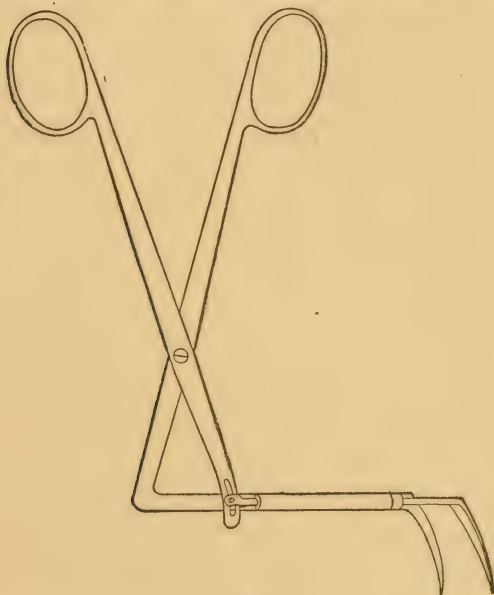


FIG. 8.

embryotomy scissors designed to aid us by accomplishing the same work through an aperture of less size than will admit the other cutting-tools. It is the suggestion of Dr. W. J. Hoffman, of Washington, who explains it in the following memorandum: "The

instrument, illustrated, and considerably enlarged, in fig. 8, resembles a pair of scissors, one blade being attached to either a hollow or a split tube through which passes the rod bearing the opposing blade. The blades can readily be introduced into the egg through a moderately sized hole, and will be found very convenient in cutting up the embryo, the remnants and pieces being afterwards removed by means of the ordinary forceps." I have myself never seen one of these instruments in operation, but should think it would prove of much service.

Mr. G. A. Boardman, a practical ornithologist, recommends that, after having picked out as much of the young bird as you safely can through a moderate hole, you blow water into the egg with the blow-pipe; then let it stand for some days in a dark drawer; keep repeating this process about every third day, gradually blowing more water into the shell, until the whole embryo has decayed and is taken away. He considers this a safe and sure way, and certainly it is better to take the trouble of it than to run any risk with a rare and valuable egg.

As much as possible of the lining membrane should be pulled out in all cases, as if this or any other matter is left inside, it is likely to attract insects and perhaps discolor the shell; the removal can be accomplished with patience and the help of such pincers

as are shown in fig. 9. A good plan is to wash the inside with diluted carbolic acid, or corrosive sublimate (chloride of mercury) dissolved in spirits of wine (alcohol) : and, at all events, very thorough rinsing is necessary — otherwise your specimen is likely to become a plague-spot in the cabinet.

☞ But do not fail to remember, that the corrosive sublimate must be used very carefully, by aid of the syringe, since it is a deadly poison.

Should the yolk of any egg be dry and hard, a small quantity of carbonate of soda may be intro-

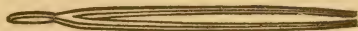


FIG. 9.

duced (but with great care that it does not touch the outer surface of the shell, as in that case the color is likely to be affected) ; then fill the egg with water from the syringe, and leave it to stand a few hours with the hole uppermost, after which the contents may easily be removed by the blow-pipe, assisted by one of the hooks.

“Whenever practicable, the embryos or young found in the egg should be carefully preserved in alcohol, great care, of course, being taken to mark the specimens properly. The better plan will be to keep each set in a small bottle or vial, and a slip of stiff paper or parchment placed inside with the num-

ber or name. Whenever the abundance of the eggs will authorize it, a large number with the young in different degrees of development, even as many as fifty of a kind, should be secured. The embryos in this case need not be removed from the egg, which should, however, be cracked at the blunt end to facilitate the entrance of the spirit."

SAFETY CONTRIVANCES.

A device given by Prof. Alfred Newton, in the Smithsonian pamphlet from which I have quoted so freely, for use in the case of eggs containing embryos, is superior to any similar invention known to me, and has been generally adopted by English oölogists. It consists in using patches of tissue paper, a number of which when gummed on to an egg, one over the other, and left to dry, strengthen the shell in such a manner that the instruments can be introduced through the aperture in the middle and worked to the best advantage; thus a fully formed embryo may be cut up, and the pieces extracted through a very moderately sized hole. The number of thicknesses required depends of course greatly upon the size of the egg, the length of time it has been incubated, and the stoutness of the shell and the paper; five or six is the least number that it is safe to use. Each

piece should be left to dry before the next is gummed on.. Slits in their margin cause them to set pretty smoothly, which will be found very desirable: an aperture in the middle of each may be cut out first, or the whole series of layers may be drilled through when the hole is made in the egg. For convenience' sake the papers may be prepared already gummed, and moistened when put on. Doubtless, patches of linen, cotton cloth, or "court-plaster," would answer equally well. When the operation is over, a

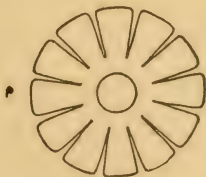


FIG. 10.

slight application of warm water will loosen them so that they can be easily removed, after which they can be separated from one another and dried to serve another time. Some of the instruments, very serviceable in this and the previously described delicate operations, are shown in fig. 7 which explain themselves. The "hooks" of course have knife-blade edges on the inside of the curve.

The most effectual way of adopting this method of emptying eggs is by using very many layers of thin paper and plenty of thick gum, but this of course is

the most tedious. Nevertheless, it is quite worth the trouble in the case of really rare specimens, and they will be in none the worse condition for final operation on account of the previous delay of a few days caused by waiting for the gum to dry and harden.

Notwithstanding the apparent fragility of eggs, a little experience will enable any one to empty them of their contents with great ease and safety. The principal accident to be guarded against is that of crushing the egg by too great pressure between the fingers; these should be applied so as barely to hold the egg, and no more. A very nervous person better not attempt it. If an operation be performed over a full basin of water, the chance dropping of the egg from the fingers into the water will usually be attended with no harm. A small instrument designed to assist in safely handling eggs while in course of preparation was recalled to the attention of naturalists, by Doctor Coues in the following paragraph in the Bulletin of the Nuttall Ornithological Club for October, 1878:

"The usual method of emptying eggs through one small hole with a bent blow-pipe is doubtless supposed to be a very modern trick; but it dates back to 1828, when M. Danger proposed 'a new method of preparing and preserving eggs for the cabinet,' which is substantially identical with the operation as

now universally practised, though he used a three-edged needle to punch the hole, instead of our modern drill, and did not refer to some of our late ways of managing the embryos. I refer to the paper less as a matter of history, than for the purpose of bringing to notice one of the tools which M. Danger recommends, and which I think would prove very useful indeed. In fact, I am rather surprised that it has been so long neglected, and strongly advise a

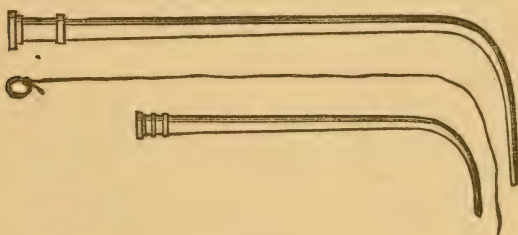


FIG. 11.

trial of the instrument as something better than fingers for holding the egg during drilling and blowing. The instrument is so simple that it will be understood without description, by a glance at the accompanying figure (fig. 12). The oval rings are covered with some light fabric, like mosquito-netting, and do not touch the egg which is held lightly, but securely in the netting. Such an instrument would cost but a trifle, and it seems worth ascertaining whether we may not avoid danger by Danger's own method."

The wetting of the outside of the egg, however, should be avoided, if practicable, as the mere contact of water sometimes injures it, marring the fine "bloom." Consequently dirt-stains or dung-spots should never be removed,—this little dirt only adding to the natural appearance of the egg, which washing would certainly mar. If you object to the bad appearance I must remind you that the object of your collecting is not the decoration of your cabinet or library, but the study of the breeding habits of the

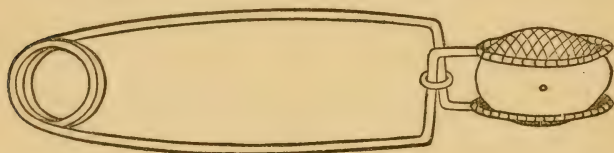


FIG. 12.

birds of your district. To change the natural appearance of the nest or egg, therefore, beyond the point of healthful cleanliness, is not permissible to the conscientious student. Varnishing is an abomination which I trust it is not necessary for me to protest against,—it is so unlikely to be practised by the sensible persons whom, without flattery, I suppose my readers to be.

Eggs that are cracked may be strengthened by placing goldbeaters' skin (which is used altogether at the Smithsonian) or tissue paper along the line of

injury, or what is easier, and in most cases even better, by brushing collodion along and over the cracks. To this same end, and also as answering the ornamental intention of varnish, I have heard the white of an egg recommended; but I consider collodion preferable whenever it can be obtained.

It is often well to cover the punctures or holes cut out, especially if large, with thin paper, silk or goldbeaters' skin. If a piece of the shell be removed, it can usually be replaced and kept in position by pasting thin paper over it and along the line of separation. Even when in this fragmentary condition, a rare egg is worth preserving. Eggs should always be left empty, except in the case of some very badly damaged ones, to which a slight solidity may be imparted by a fluff of cotton.

AUTHENTICATION.

Having placed your nests and eggs in the proper condition for safety and study, with a knowledge of what their true names are, the next thing is the authentication of these specimens in a manner which in future will admit of no doubt of their identity and history. This, as I have hinted before, is of the utmost importance, and neglect in this direction is inexcusable and unprofitable, as you will sorrowfully

find whenever you attempt to increase your possessions by exchange of property with other collectors.

It is best on all accounts to keep eggs in sets, a "set" being whatever number were found in a single nest; and if you are saving the nests—which again let me beg of you to do—undoubtedly the best place to preserve the eggs is in their natural receptacle, where a few bits of cotton will prevent disastrous jarring. The history of the nest may be written on a label of tough paper and sewn to it. This will not injure it, and there will be no chance of displacement. Each egg in it must be marked as faithfully as those which are separated from their nests and classified in the drawers of the cabinet. The most scrupulous attention must be paid to accurate, complete, and permanent labelling. "So important is this," says Dr. Coues, "that the undeniable defacing of a specimen, by writing on it, is no offset to the advantages accruing from such fixity of record."

The most complete method of authenticating eggs is that of writing in ink on their shells, not only the name of the species to which each belongs, but also, as far as the space will admit, many particulars relating to the amount of identification to which the specimen was subjected, the locality where, date when, and name of the person by whom it was

taken, adding always a reference to the Journal or Note-book of the collector, wherein *fuller details* may be given.

SUGGESTIONS FROM NEWTON AND OTHERS.

It being advisable to pursue some regular system in marking, the following method has been suggested by Professor Alfred Newton of Magdalen College, Cambridge, — at present, no doubt, the chief of British ornithologists, — as one found to work well in practice :

The *scientific* names *only* are to be used, in all cases where the specimens have really been satisfactorily identified. If this was accomplished by obtaining one or both of the parent birds, a memorandum of the fact is to be added, thus: "Both birds snared;" "Bird shot;" or, in smaller space, "Bd. st." If the identification has been effected only by a good view of the birds, the fact should be stated thus: "Bird well seen," "Bird seen," or "Bd. sn." For eggs not taken by the collector himself, but brought in by persons not having a scientific knowledge of ornithology, the local name or the name applied by the finder should only be used, unless indeed it requires interpretation, when the scientific name may be added, but always within

brackets, thus: "Toogleeayah [*Squatarola helvetica*];" the necessary particulars relating to the capture and identification being added. Eggs found by the collector, and not identified, but the origin of which he thinks he knows, may be inscribed with the common English name of the species to which he refers them; or with the scientific name, but always with a note of interrogation (?) after it, or else the words "Not identified."

In his Field Ornithology, Dr. Elliott Coues advises similarly: "An egg should always bear the same number as the parent in the collector's record. In a general collection, where a separate ornithological and oölogical register is kept, identification of egg with parent is nevertheless readily secured, by making one the numerator, the other the denominator of a fraction, to be simply inverted in its respective application. Thus, bird No. 456, and egg No. 123, are identified by making the former $\frac{456}{123}$, and the latter $\frac{123}{456}$. All the eggs of a clutch should have the same number. If the shell be large enough, the name of the species should be written on it; if too small, it should be accompanied by a label, and may have the name indicated by a number referring to a certain catalogue. According to the present [*i. e.*, Dr. Coues's] 'Check List,' for example, No. 1 would indicate *Turdus migratorius*. The date of collection

is a highly desirable item; it may be abbreviated thus: '3, 6, 72' means June 3, 1872. It is well to have the egg authenticated by the collector's initials at least. Since 'sets' of eggs may be broken up for distribution to other cabinets, yet permanent indication of the size of the clutch be wanted, it is well to have some method. A good one is to write the number of the clutch on each egg composing it, giving each egg of the set, moreover, its individual number. Supposing, for example, the clutch No. $\frac{1}{4}\frac{123}{56}$ contained five eggs, one of them would be $\frac{1}{4}\frac{123}{56}$ 5-1; the next $\frac{1}{4}\frac{123}{56}$ 5-2, and so on. But it must be remembered that all such arbitrary memoranda must be systematic, and be accompanied by a key."

Another invention in labelling was announced by Mr. W. H. Ballou, in a communication to the *American Naturalist*, vol. xii, 1878, page 306, of which I quote the substance:

"Having occasion during the past year to make an arrangement of the collection of oology in a certain Academy of Science in the west, my attention was more than ever drawn to the absolute necessity of having a different system of labelling from the one I employed there, especially in so large a museum, where duplicate eggs are stored away by the thousand with no distinction whatever. Soon after obtaining additions to my own collection of eggs, some

of which required mending, I was attracted by the wonderful adhesive force of coaguline in cementing shells together. Following out the line of thought presented at this time, I was enabled to perfect a system of labelling which is essentially described here :

“Slips of paper are to be prepared in triangular form, or at least to have one portion tapering to a

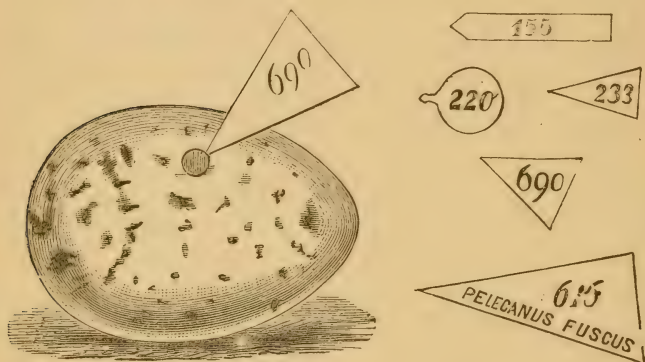


FIG. 13.

point, as figured above. The slips can be cut in sizes varying with the dimensions of the egg, or the amount of writing intended to be placed upon them. Having made the necessary record, the very tip of the label may be moistened with coaguline and fastened to the egg as in fig. 13. It should be placed on the border of the drilled hole on the side, so that both may occupy as little space as possible. Almost

the entire surface of the egg is now in a condition for examination. The advantages of such a label are seen at once. Both sides may be written upon. They may be used as handles by which to hold the egg for examination, thus saving many eggs from being crushed. They may be made sufficiently large to contain all necessary writing, or small enough to suit the taste. They may be taken off at any time by simply dipping the cemented portion into warm water; and it is often desirable to do this, especially in exchanges. There is no possible danger of their being torn off when they are handled with the care usually bestowed on eggs.' ”

OBJECTIONS TO THE FOREGOING ADVICE.

Theoretically these various schemes are nearly perfect; but practically there are enormous difficulties in the way, and an attempt to surmount or compromise with them would almost surely lead the novice into just what he is trying to avoid.

It is not imperative that several of the items mentioned should be attached to the egg any more closely than by a reference to a record where all details are given. It is only a few eggs whose shells afford sufficient room to record one-half these particulars. In the case of large eggs, if you can write finely and

yet distinctly, there can be no other objection to inditing all the circumstances of its discovery, than that it needlessly defaces the specimen; but in the case of the smaller species it is simply impossible.

Never having myself seen the third plan in practice, I can only leave it with each one of my readers to choose whether it will serve his purpose. It might be an excellent idea for the duplicates of a large museum, since it is rapidly applied and leaves the shell free for the ultimate owner to write upon if he chooses and what he chooses; but I should think the many little three-cornered labels would look very odd in a private collection, quite destroying the beauty of the cabinet, which is something of no little importance to the egg-fancier. The papers would hide the small eggs, too, I fear. But the great objection is, that in spite of the "wonderful adhesive force" of coaguline or any other gum, some, if not many of the labels, would be sure sooner or later to come off, and then—where is your authenticity?

What is wanted is a system which shall be very simple yet suitable for all sizes and conditions of eggs. To fill this want, probably no method of keeping records has been offered better than that proposed in the succeeding paragraphs, which has been used both in the United States and in England with great satisfaction.

A PROPOSED FORM OF RECORD-BOOK.

Provide yourself with a blank book of considerable size. If you buy a new one, get one well bound, having good paper and at least one hundred and fifty quarto pages. Call this your Ledger, and on the first page write :

"The first number inscribed upon each egg in the collection, of which this is the record, corresponds with the number of the species of bird to which it belongs, as enumerated in the revised edition (1881) of the Smithsonian Institution's Catalogue of American Birds, published as Bulletin Number 21 of the National Museum."

It should be explained at this point, that three catalogues of North American birds have been issued by the Smithsonian Institution to date, under the following titles :

(1) Catalogue of North American Birds, chiefly in the Museum of the Smithsonian Institution. By Spencer F. Baird, Secretary of the Smithsonian Institution. Washington, Smithsonian Institution. October, 1858. 4to, paper. 1 p. l., pp. xvii-lvi. [Reissue, with new title-page, of pp. xvii-lvi of vol. ix, Pacific R. R. Reports ("Birds of North America"). Includes, besides the list of 738 species, with habitats, tables of the higher groups,

and lists of extralimital species (23 in number) treated in the general report, and of others (31) claimed, on apparently insufficient grounds, as North American; also a summary of the number of species given in the works of Wilson, Bonaparte, and Audubon.]

(2) Catalogue of North American Birds, chiefly in the Museum of the Smithsonian Institution. By Spencer F. Baird. First octavo edition. Washington, Smithsonian Institution. [Smithsonian Miscellaneous Collections, No. 108.] 1859. 8vo. 2 p. ll., pp. 19 + 2. [Based upon the quarto list of 1858, but without habitats, and the matter relating to classification, etc. The two additional pages are an alphabetical index of the North American genera. As in the quarto list, there are, ostensibly, 738 species, but there are 22 interpolations, making a total of 760 names in the list.]

(3) A Catalogue of the Birds of North America. By Robert Ridgway. <Proc. U. S. Nat. Mus. iii., Aug. 24–Sept. 4, 1880, pp. 163–246.

(4) Nomenclature of North American Birds chiefly contained in the United States' National Museum. By Robert Ridgway. <Bulletin U. S. Nat. Museum, No. 21. Washington, March, 1881. [Though Mr. Ridgway's catalogue of the previous year is really the basis of the present one, this revised edi-

tion was very materially modified, by numerous alterations and corrections, involving not only the change of a considerable number of names, but also the writing of a new introduction, etc. This list will now remain as the standard for labelling in the National Museum, and will be sent to all applicants by the Smithsonian Institution, in place of the obsolete Check List of 1859. I recommend its universal adoption in labelling and in exchanging eggs, because it is the standard, because it is the latest and most complete list, and for the sake of uniformity, a consideration of great importance.]

Let me return now to the proposed form of record, the second paragraph of which will read :

The second number with its annexed letter, always in brackets [], refers to the page of this Ledger, and paragraph a, b or c, etc., therein, where the full history of the specimen may be found.

At the head of the next page of the Ledger you can put the names—common and scientific—of the first bird whose eggs you collect, preceded by the Check List number, devoting the page, or half of it, to the record of that bird's representatives in your cabinet. The history of the first nest of eggs, then, will appear (page 2) in somewhat such a shape as the following,—supposing it was a summer yellowbird's :

PAGE 2.

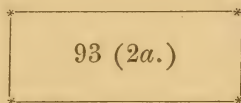
93. DENDRÆCA ÆSTIVA (*Gm.*) *Bd.*—Yellow Warbler.

-
-
- a.* Nest and 4 eggs (fresh), found May 25, 1878, in a lilac bush in the College grounds, Jonesville, Me. Bird snared on the nest, which she had begun to build on May 18. See *c.*
- b.* Eggs (four, slightly addled) taken by John Smith from a nest on the bank of Farmer's Creek, two miles west of Jonesville, Me., June 3. He shot the bird, the skin of which I saw.
- c.* Nest and three fresh eggs, taken from the same tree as was *2b.* Probably the same pair of birds. This nest was more loosely made than *93a*, and the female had begun sitting on three eggs.
- d.* Five eggs (a set) bought of James Brown, Portland. Said to have been collected in Ritchie County, West Va., by David Jones.
- e.* Nest from a bush in my garden, begun May 30; first egg laid June 4; began to sit June 8; young hatched on the 19th. (For interesting observations see Journal, p. 29.) Nest peculiar from having stolen bits of lace interwoven in it.
- f.* Five eggs (set) got in exchange from X. Beedler, Cleveland, Ohio. Identification was assured correct; but I am now inclined to doubt it. See Journal, p. 45.

The nest to which the first entry (*a*) in the record above given refers, will be found labelled (since its size will admit of it) as follows :

93	<i>Dendroæca æstiva</i> —Yellow Warbler. College
—	grounds, Jonesville, Me., May 25, 1878 ; 4
2a.	fresh eggs ; bird identified. John Smith.

The eggs will each be labelled alike, and bear simply two numbers, thus :



That is : The name of this egg is No. 93 of the Smithsonian Check List of 1881 ; the history of it forms item *a* on page 2 of the collector's Ledger. Then, if the egg is large enough, you may write upon it your initials, as further authentication.

ADVANTAGES OF THIS PLAN.

The advantages of this plan are many. It is possible to apply it to all eggs, however small or in whatever way obtained ; it does away with all private catalogues of cabinets, and, by making a standard list of the birds of the whole United States the uni-

versal catalogue for all collections, no confusion can arise. Every one, who knows anything about American eggs at all, will know at once (or if he did not, it would take him but a short time to discover) what the first free number, "93," means. In exchanging, no confusion of identity can occur, and the least possible amount of re-marking is necessary, since it would probably happen in the majority of cases that you could adopt as your Journal-number the page and letter, or at least the letter, which came upon the egg from your correspondent. Moreover, it inculcates in beginners a most useful and friendly habit of system and order. All things considered, the plan is superior, in my estimation, to any other method (practicable for all eggs) in at once authenticating and cataloguing the eggs and nests composing a collection.

VALUE OF FIELD-NOTES.

I call the record-book a Ledger, because it is the careful summary of all field-notes. Your Field-Book is a small pocket volume, which you take out with you, and wherein you jot down memoranda of your discoveries—perhaps in abbreviated form. When you get home you "post" these jottings into the Ledger in proper and legible shape, putting in no

symbols or writing which any one else cannot read or easily comprehend. In addition to this, if you are a real naturalist, you will find it worth while to keep a rather full natural-history Journal, in which each evening you can write out your observations for the day on the plants, reptiles, birds and quadrupeds which you have seen, with such other matters as came under your observation. Often this Journal will contain much information upon the habits of the birds of whose eggs you make a record in your oölogical Ledger, and a reference to the page of your Journal on which this information is written ought to be appended to the Ledger item. Some keep a separate Ledger for the eggs they obtain by exchange, but I see no advantage in so doing.

When you come to review this record,—for you will occasionally do so with fond pleasure on cold November nights, as you sit with your slippers feet against the fender,—you will recall the balmy spring days when the notes were fresh, will revive a thousand delightful experiences, and reproduce to the imagination those scenes and sensations of merry woodland and meadow which the ornithologist loves. More practically, you will be surprised and interested to discover how large are the stores of out-door facts you have stowed away; and, by and by, prompted by some companion's inquiries, discussion with a

correspondent, or a paragraph in a newspaper, you will bring memoranda of a kind together and make a little article for publication. Then, if you have written what are really facts, got by fresh observation, others will speedily know of it, and you will begin to taste a morsel of that of which you can never become quite satiated—reputation.

Suppose, for example, the subject is suggested of the odd names by which the familiar *Colaptes auratus* is called in different parts of the country. Looking through your Journals you find that, in the course of both your correspondence and active birds'-nesting, you have heard and jotted down a considerable number of these vernacular names, and taking your pen you make a list of them with the localities where each is to be heard, as follows :

Golden-winged Woodpecker	General.
Yellow-shafted Woodpecker	General.
Flicker, or Yellow-shafted Flicker	General.
Yellowhammer	General.
Highhole, or Highholder	General.
Pigeon Woodpecker	New York and New England.
English Woodpecker	Long Island; Newfoundland.
Yárrup, or Yúcker	New York; Pennsylvania.
Caveduc, or Ometuc	Maine.
Wild Hen	Maine.
Clape	New York.
Wákeup or Wahcup	Massachusetts; Long Island.
Shad Spirit	New England coast.

Hittock, or Hittuck	Canada.
Fiddler	Cape Cod.
Yaffle and Woodquoi	Connecticut.
Yellow Jay	Wisconsin.
Piúte, or Pee-út	New England.
Pique-bois Jaune	Louisiana.
Woodpecker-lark	Georgia.
Sapsucker, or Sucker	Florida.
Gël Spēcht; Spēcht	Pennsylvania German.

Examining this list one sees how several of the names might arise. The expressions "golden-winged," "yellow-shafted," the French "pique-bois jaune," and the German name (pronounced *gail speycht*), refer to the color of the wing-quills, of course, which are very conspicuous. "Yellowhammer" (Indian, "allabama") was among the very first names given by the colonists to this bird, and, like "yellow jay," alludes to the color, utterly irrespective of likeness of form to the namesake in each case. The word "flicker," undoubtedly designates its well-known wavering manner of flight, to which the alternate appearance and disappearance of the yellow quills give a twinkling, *flickering* look. "English woodpecker" perhaps belongs to the same category.

As for "pigeon woodpecker," I think it arises from the peculiar pigeon-like attitude of this species, in perching *across* the branch, instead of lengthwise

along it as do other more genuine woodpeckers. "Highhole," "highholder" and "woodwall" (of which last I have a note, but no location) describe the bird's home, of course; and "sapsucker" states the popular idea that that is what all woodpeckers are doing when they move about tree-trunks in search of insect food. What "yaffle," "woodquoit" and "fiddler" signify, I have no idea. Concerning "clape" Dr. DeKay remarks: "Some provincial word introduced by the early English colonists." As for the southern word, "woodpecker-lark," it of course refers to the black crescent upon the breast, which reminds one of the similar badge of the meadow-lark; but it perpetuates an error, for that handsome bird is not a lark at all, but a starling—*Sturnella magna*. Its practice of laying additional eggs when the first set is removed gives the bird the name of "wild hen" among the people of Maine, according to Mr. Manly Hardy.

"Hittock," though now a Canadian term, appears to have been handed down from the Delaware Indians, since Heckewelder says that *hittuck* was the Lenni-Lenape word for tree, and also that the Swedes, who colonized the lower Delaware valley in the seventeenth century, gave the name "tree-peckers" to this whole race of birds. In the name "shad-spirit" is

embodied a half-superstitious idea of the New England fishermen of former days (and it may be perpetuated until now) that this bird came up from the south and ascended the rivers just ahead of the vernal migration of shad, in order to inform them of the approach of the fish; it is the noting of a coincidence, in other words.

The terms, "yarrup," "wakeup," "caveduc," "om-etuc," "pi-ute," and "yucker," evidently represent the harsh, well-known cry of this species; that is, they were at first intended to be imitations of one or another phase of the bird's voice, but have become changed and corrupted, until, perhaps, they no longer answer well to any of its notes. Nuttall has a pertinent note on this head in the second edition of his *Manual of Ornithology*, which I quote herewith: "They have also a sort of complaining call from which they have probably derived their name of *pee ùt, pee ùt*; and at times a plaintive *quécàh quécàh*. Occasionally they also utter in a squealing tone, when surprised or engaged in amusing rivalry with their fellows, *we-cõgh, we-cõgh, we-cõgh, we-cõgh*, or *wecũp, wecũp, wecũp*."

So much for the contribution to a single item of ornithology (and philology, too, for that matter), which the re-reading of your Journals on a cold November evening may produce.

MARKING AND MEASURING.

The marking of eggs should be indelible. A few of the ornithologists in the neighborhood of Boston choose to mark their eggs with a soft lead-pencil only, wishing to avoid the danger of pricking or scratching through the delicate shell, by reason of unsteadiness of fingers in handling the sharp-pointed pen which is needful for fine lettering. This is a serious danger, certainly ; but on the other hand, the mark of a soft lead-pencil is too easily erased. As a happy medium I would suggest the advantage of black ink and a soft quill pen, or else India ink applied with a small camel's-hair brush ; but the safer way is to use black ink and a quill pen. On those eggs that have a chalky outer layer, and some that have heavy black markings, the number may be scratched ; but this must be done with care. Specimens having very darkly colored surfaces, such as some heavily blotched varieties of hawks' eggs, will not show ink plainly, and must be written upon with white paint, a finely pointed sliver answering well the purpose of a brush. Never trust to gummed labels ; they are liable to come off—even when stuck on by a single corner with coaguline !

Eggs are measured in two directions—their greatest length and greatest width. To do this, ordinary

calipers can be used—a small size for the little eggs, and a larger size for the big ones : though, unless the calipers work very smoothly, accidents are likely to happen. A more satisfactory method is to purchase or make a machine with a sliding-bar, like a shoe-

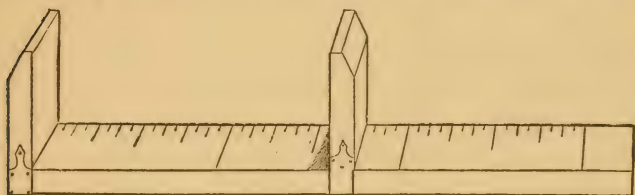


FIG. 14.

maker's foot-measure of diminutive proportions. Having fitted the bars snugly to your egg, ascertain the distance between the bars by a pair of draughtsman's dividers of the ordinary pattern, and find the

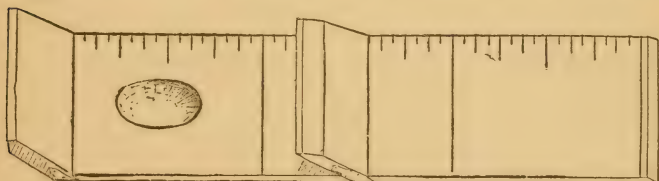


FIG. 15.

number of inches and hundredths by comparing with some standard rule ; unless, indeed, the measuring stick, upon which your egg lies and the movable bar slides, is marked off in inches and hundredths of an inch. It would be well to have a slight depres-

sion in the bottom stick, as shown in the cut, to prevent the egg rolling about.

Though worse than worthless unless great care is exercised, the precise measuring of all your eggs is of the highest importance. It will help to determine the amount of variation to be met with in each species, and tend to show whether there is any law governing this, as there seems to be in the case of the plumage and proportions of birds inhabiting widely separated districts.

The late Dr. Brewer was fond of calling attention to the lesser size of eggs from southern localities as compared with specimens of the same name taken in the northern states or in Canada. He believed this difference to be uniformly the fact, but could not persuade all his correspondents to agree with him. It is a point for your studious investigation.

Even eggs from the same nest may continually be met with, presenting great disparity in bulk; one in the number being frequently so small in comparison with the others as invariably to set a collector thinking it must have been the last laid, and that a partial failure of egg-producing power in the mother-bird must be the explanation of the phenomenon.



THE CABINET.

III.

THE CABINET.

The next question that presents itself is: "How shall I construct and arrange my cabinet?"

Several things are to be considered in coming to a decision on this point.

QUALITIES NEEDED IN A CABINET.

First, there is the matter of safety. Your eggs must not be subject to accidents which will break or disarrange them; must not be eaten by mice, knocked over by your dog or cat, or even handled by your family or any one else in whose experience you have not the utmost confidence. And just here let me whisper to you, that when you are visiting a neighbor's collection it is best not to touch a single specimen until you are quite sure you have been permitted to do so; and to be exceedingly careful to return each egg to the precise place from which you have taken it. You may save your friend much jealous anxiety by

this sort of care ; and make a reputation for a habit of keeping your "hands off," which will be of advantage to its possessor.

Then the tightness of the cabinet is a very important thing to be looked after. Your treasures must not be exposed to the light, or they may fade ; must not be where insects can get at them, or they will be covered with dirt and probably inhabited ; must be kept free from dust, or they will go to ruin.

These various desiderata are best satisfied in an upright case of drawers, of good size, which shall be closed in front by one or two doors fitting as closely as art can make them do. The fronts of the drawers, also, ought to be as tight as possible. Each drawer may be locked if you wish, but it will be sufficient to lock the doors ; and this should never be neglected, or the key left where careless hands can get hold of it. It is only by guarding them as though they were jewels that you can preserve in your collection the high degree of beauty and value which ought to be your aim.

PROPER CONSTRUCTION OF DRAWERS.

The drawers should not be all of the same depth, if your case is made specially for this purpose. If you make use of an old case, with deep drawers, you can accomplish the desired economy of space by

having one or more movable trays to set in the drawers, resting on supports which will raise them a certain distance above each other. But this is dangerous, since they are likely to fall in lifting out and in, and the better way is to have drawers of unequal depths. The smaller drawers at the top need not be more than two inches in inside depth. This will accommodate all the eggs in the list as far down as the crows. After that, let there be an increase of an inch for two or three drawers more, which will bring you to the hawks. The eagles' eggs will require another inch in depth, which need not be added to again for about two drawers, until you come to the cranes, when increase of the depth by another inch will give you room enough for all the rest. This supposes that you do not put nests into the drawers. If you keep these, you must have different accommodations, or else separate your nests from the eggs,—at least separate them from one typical series of eggs. The latter plan is pursued by many.

In placing eggs in the cabinet, you will of course follow a definite classification,—presumably the one set forth in the latest catalogue of the Smithsonian Institution, to which I have already called attention. Any arrangement of eggs according to size, or for "artistic effect," or, in any other way, than in the

nearest possible approach to Nature's grouping, is utterly foreign to the true purpose of our collection. As your eggs will be of all sorts from the very beginning, each drawer almost at first will contain a few, according to their place in the list; and your pleasure and aim will be to fill up the gaps by new accessions.

MR. SALVIN'S IMPROVEMENTS.

The interior arrangement of the drawers is important, and the beginner, if left to his own ingenuity, will make many trials before arriving at a satisfactory method. Some oölogists spread fine sand all over the bottom of the drawer, and half sink the eggs in this, or use sawdust or cedar shavings for the same purpose, the cedar chips being recommended by the useful quality of their aroma, which, while delightful to us, is highly obnoxious to the very insects the collector dreads and wishes to keep strictly away. Others divide the bottom of the drawer into sections by fixed partitions, and pad the sections with cotton or sawdust, or by a general carpet of Canton flannel (fuzzy side up), laid down before the partitions are put in. Mr. Osbert Salvin, of England, has invented a plan which was explained in *Hardwicke's Science Gossip* for 1872, page 75, and is highly recommended.

"Mr. Salvin's cabinets are so constructed that the drawers, of different depths, are interchangeable. This is effected by placing the runners, which carry the drawers, at a fixed distance from each other, and making the depth of each drawer a multiple of the distance between the runners. For example: if the runners are $\frac{3}{4}$ of an inch off each other, then let the drawers be $1\frac{1}{2}$, $2\frac{1}{4}$, 3, $3\frac{3}{4}$, $4\frac{1}{2}$, etc., inches deep. All these drawers will be perfectly interchangeable, and a drawer deep enough to hold an ostrich's egg can, in a few moments, be placed among those containing warblers'. . . . Mr. Salvin's plan of arranging the eggs is equally simple, and admits of any amount of change with very little trouble. Each drawer is divided longitudinally by thin slips of wood into three or more parts, about 4 to 6 inches across, as may be convenient. A number of sliding stages are then constructed of card-board, by cutting the card-board half through, at exactly the width of the partition, and bending the sides down to raise the stage to the required height. A number of oval holes are then to be cut by hand, or with a wadding-punch of suitable size (altered in shape by hammering), and a thin layer of cotton-wool gummed on the upper surface of the stage: the holes, of course, should be suitable in size to the egg they are intended to receive. Between these stages sliding partitions

must be placed; these should be made of just sufficient height so that the horizontal part may fit closely on the wool. These partitions should be made of thin wood for the upright part, along which a horizontal strip of card-board is to be fastened with glue, on which is to be placed a label bearing the name of the species of egg displayed on the stage.

"This may appear very complicated at first sight, but a few trials will be sufficient to master the details, and the result will be very beautiful if neatly carried out. The eggs are well shown, not liable to fall out of their places, and it is very little trouble to alter the arrangement. Each drawer should be covered by a sheet of glass to keep out the dust."

This plan Mr. Robert Southwell, the author of the exposition quoted above, considers to be "as near perfection as it is possible to arrive at." The only objection I can find is the large original outlay of money required; but in many cases this could be afforded, and in others no doubt a cheap application of the hints may be made to existing cabinets, or to those of less elaborate construction than Mr. Salvin's.

THE BEST ORDINARY ARRANGEMENT.

Undoubtedly, however, the best ordinary and practicable method of keeping eggs is by laying them

in little pasteboard trays, each holding a set, and containing a paper label on which various items that cannot be traced on the shell are written in full. The trays may then be classified in the shallow drawers.

"Such trays should all be of the same depth,—half an inch is a convenient depth for general purposes; and of assorted sizes, say from one inch by one and one-half up to three by six inches; it is convenient to have the dimensions regularly graduated by a constant factor of, say half an inch, so that the little boxes may be set side by side, either lengthwise or crosswise, without interference." They may be made to order, without much cost, by any box manufacturer; or a druggist will sell to you boxes used in his business which are highly suitable.

I think we may borrow a hint from the conchologists in the case of small and rare specimens, which we want to show freely, and yet regard as almost too precious to be looked at with one's eyes wide open. I refer to the use of stout, short test-tubes of glass, of a size suitable to the egg. These are made for the use of chemists and can be bought by the dozen; or, tubes of glass can be bought and cut by yourself into suitable lengths. A whole suite of any of the smaller eggs can be inserted one by one in the same tube, each egg separated from its fellow and ren-

dered immovable by a partition of cotton, and the whole tube securely corked. It can then be handled and the valuable contents examined on all sides through the glass with perfect safety. I have found this to be a very satisfactory plan for rare and fragile specimens and it might well be adopted in respect to all eggs of less size than those of a thrush.

LABELS.

For labels, tolerably stiff paper should be used, and the writing should be with ink. Give the scientific and common name of the bird whose egg you label; where it was found, and the date, with your signature and the numbers in Check List and Ledger as heretofore advised. A printed blank is neat and convenient, and costs little. I would recommend the following form, in red ink, but you can suit your own fancy :

100	Collection of Thomas Brown, New York					
	Name	.	.	.	.	.
2a.	Locality	.	.	.	.	.
				Date	.	.

It looks well in the cabinet, also, to cut the printed names from the Check List, and paste them on the inside (at the edge) of the tray holding the eggs of the bird specified.

ADDING TO THE COLLECTION.

I am acquainted with one or two collectors, and have heard of others, who, on account of some bodily infirmity, or for some other reason, have never themselves procured any but a trifling part of their property in birds' eggs by their own efforts. It is possible, of course, for such a person to learn much himself, and become of service to the science generally as a critic; but after all, the man who really enjoys his collection, and lays his brother ornithologists under obligation to him for facts, is he who does his own collecting, and can tell you a story of some small adventure with nearly every nest and egg in his cabinet of the birds belonging to his locality.

While, then, it is hoped that you, my reader, will have such opportunities that you will be able to enlarge your collection chiefly by your own field-work,—for therein lies the great delight of having an oölogical cabinet, where each specimen is a memento of a happy hour—yet it may be that you will resort more or less frequently to exchanging duplicates with other collectors.

PROFITABLE EXCHANGES.

In order to conduct an exchange judiciously, some little judgment and experience are required.

In the first place you must study the geographical distribution of the birds of North America in order to know what species never will breed in your neighborhood, and which consequently you never can hope to find wild ; and, second, what ones that do breed with you are rarest elsewhere, and therefore would be most in demand.

The latter consideration will of course change according to the region where your correspondent of that moment happens to live. Some birds have a special "local distribution," as it is termed, that is, they are to be found only in spots ; I do not know, for example, that the blue warbler (*Dendroæca cærulea*) breeds plentifully anywhere except in southern Illinois. These are especially to be prized, and if from some peculiarity of geographical position or by accident, you have one or two such species as common summer residents, you will do well to gather many duplicates of their nests, since you can always exchange them to advantage. ☞ Mark all your duplicates as exactly as you do the eggs in your own cabinet-series.

Though sometimes impossible, yet generally you ought to know something about the person with whom you propose an exchange of eggs ; and you ought to be willing to give a guarantee in return. Even *personal* honesty you will find of value in this matter

as well as in other transactions, but in addition you want scientific honesty so that you may trust that your man will not invent eggs to fit names you are seeking, or names to fit eggs he would like to get rid of. "A shade of suspicion," as Dr. Coues remarks, "is often attached to dealers' eggs, —not necessarily implying bad faith or even negligence on the dealer's part, but from the nature of the case." Doubt, from any source, is inadmissible in the commerce of natural history.

STANDARDS FOR EXCHANGING.

How shall an exchange be conducted? On a cash basis or species for species?

The best law, no doubt, is the Golden Rule, for the advantage of both parties. Friends who can meet and talk it over can arrange a "trade" without difficulty. Among strangers, negotiating by correspondence, the matter becomes more complex. In the city of Brooklyn, and elsewhere, I believe, clubs have been formed for the purposes of mutual interchange. These clubs fix an arbitrary cash value to every egg—say a robin's egg shall be worth five cents and a golden eagle's egg five dollars. On the basis of this valuation, which may or may not represent the market price of each egg, all exchanges

are conducted. This is a very good method. In the absence of some such standard I like best to say, "Give me a set of such and such eggs, which I want, and I will give you these specimens that you want." If the other party agrees, it is settled, and both are satisfied; or if either is not, the other ought to make him so, provided he is sincere.

HOW TO PACK SAFELY.

To pack eggs for transportation, each one should be wrapped in a light envelope of cotton and laid down in layers separated by strata of cotton. It is convenient to prepare long strips of cotton-batting half an inch or an inch wide, in which to enwrap eggs, which are afterwards wound with a few turns of thread to secure the swathing, or twisted into bits of soft paper to the same effect. They should be put into rather small boxes of wood or tin; but if paste-board be used, these should always be transmitted inside a wooden box, as the eggs are thereby less likely to be broken by a sudden jar or shock.

Bran, saw-dust, etc., should not be employed as packing, since it will sift to the bottom, allowing the eggs to jar together and break in the top of the box. Single eggs may safely be mailed to a distance in auger-holes bored in wood, in cylinders made by

rolling car-board over disks of wood or in stout little boxes which will withstand the vicissitudes of the mail-bag. The Post Office regulations in regard to stamping and sealing objects of this character should be carefully studied to avoid undue expense and danger; but, if any quantity of eggs are to be forwarded at once, they had better be sent by express than intrusted to the mails.

If the nest is sent along, it may contain the eggs belonging to it, each one wrapped in cotton, and the vacancy of the nest filled with the same or other light elastic material. It will be well to pin or tie up each nest in paper to keep it secure, and to prevent entangling the materials when several are laid together. A temporary box may often be readily constructed of pasteboard, to contain the more delicate or valuable nests, having tender walls.

Experience will soon teach the best ways of packing eggs under varying circumstances of transportation, and the habitual care with which the earnest and conscientious oölogist does all things connected with his fragile treasures will insure him against *taking risks* instead of *taking pains*.

THE DUTY OF CARE.

Having collected your treasures, guard them at least as vigilantly as would the mother-birds whom

you have deprived. The care that you take of nest and eggs, and their serviceability in teaching yourself and others, form the only excuse for rifling the homes of the feathered denizens of woods and meadow.

And now before closing this little book, which has taken to itself the dimensions of a volume out of an original intention looking merely to an essay, in a self-arrogant way that has somewhat amazed me, I would like to call your attention to a few of the reasons why the study of the nidification of our birds should be held important, and how it may be made to contribute most valuable material to our knowledge not only of the life of birds in general, but to the whole of zoölogical science.

THE HEART OF ORNITHOLOGY.

As I have remarked at more length elsewhere:¹ "The true home of a bird is where it rears its young, even though it be not there more than a third of the year, and everywhere else it is merely a traveler." In contemplating its habits at this season, we take the bird at home, see it at the zenith of its career, when its life is most concentrated, its being

¹Friends Worth Knowing: Glimpses of American Natural History, New York, p. 99; Harper & Brothers, 1880.

and capabilities thoroughly exhibited, its youthful as well as its adult characteristics in all respects displayed at their best. During the winter, and at the time of migration, we have in view only a partial, absentee phase of a bird's character,—even of its plumage; naturally, it is when at home in the summer that we are presented with the more nearly complete picture. An oölogist, then, can better afford to neglect the study of birds during other seasons, than can the general ornithologist to be ignorant of how his favorites behave at breeding-time. Many arguments plainly favor the proposition that, apart from questions of systematic arrangement, the study of breeding-life is by far the most essential of all the subdivisions of the science of ornithology.

Furthermore, it seems to me that it is a specially delightful department of that science where all is a revelation of such beauty as seems nowhere else to exist in natural history, unless it may be in the group of butterflies and moths or in the study of flowers. I have been criticised for saying (in the paragraph following the words quoted a moment ago) that perhaps there is no animal in the world which comes nearer to man's heart, and seems more akin to his own humanity than the bird, because of its beautiful home-life, and the loving care with which it anticipates and provides for its brood; that there is a charm

about the nest of a bird that does not linger about the hive of the wild bees, the burrow of the wood-chuck or the dome of the musk-rat; and that it is more a *home* than any of them. Yet I believe it would be found true were a correct record available of the impressions made upon the hearts of men and women the world over. That it is a temporary abode in most cases does not matter; around it are grouped the poetic and pathetic associations which really make and mean *home* in the human sense of the world,—and so are we drawn to the tender and graceful builders.

NEW GROUND TO BE EXPLORED.

But, to become more practical, it must not be forgotten that plenty remains to be learned concerning the nidification of our birds. Considering the vast extent of territory in North America, and the number of species counted in our avifauna, it is surprising, indeed, that we are as well informed as we are on this matter. It will be worth while, however, to point out some present deficiencies in order that the younger students may be guided in directing their efforts in the most productive channels.

First, there is a considerable number of our birds whose nesting is not known at all. I will not pre-

tend to give an exact list of these, but will mention a few; the discovery of the nest and eggs of any one of them would be a plume in the cap of an ornithologist—indeed the birds themselves, as a rule, are rare enough to make their skins highly prized in collections. Following are the names:

LIST OF BIRDS

Whose Nidification is Unknown.

HARPORHYNCHUS REDIVIVUS LECONTEI.

Leconte's Thrasher.

POLIOPTILA PLUMBEA BAIRD.

Plumbeous Gnatcatcher.

POLIOPTILA CALIFORNICA BREWSTER.

Black-tailed Gnatcatcher.

REGULUS OBSCURUS RIDGWAY.

Dusky Kinglet.

REGULUS CUVIERI AUDUBON.

Cuvier's Kinglet.

LOPHOPHANES WOLLWEBERI BONAP.

Wollweber's Titmouse.

PSALTRIPARUS PLUMBEUS BAIRD.

Lead-colored Tit.

PSALTRIPARUS MELANOTIS HARTLAUB.

Black-eared Tit.

THRYOMANES BREVICANDA RIDGWAY.

Guadaloupe Wren.

- TROGLODYTES INSULARIS** BAIRD.
Socorro Wren.
- ANORTHURA ALASCENSIS** (BAIRD) COUES.
Alaskan Wren.
- HELONÆA SWAINSONI** AUD.
Swainson's Warbler.
- HELMINTHOPHAGA BACHMANI** (AUD.) CABAN.
Bachman's Warbler.
- HELMINTHOPHAGA CINCINNATIENSIS** LANGDON.
Cincinnati Warbler.
- HELMINTHOPHAGA LAWRENCEI** HERRICK.
Lawrence's Warbler.
- HELMINTHOPHAGA LEUCOBONCHIALIS** BR.
White-throated Warbler.
- PARULA PITIAYUMA INSULARIS** LAWRENCE.
Socorro Warbler.
- PERISSOGLOSSA TIGRINA** GMELIN.
Cape May Warbler.
- PERISSOGLOSSA CARBONATA** AUDUBON.
Carbonated Warbler.
- PEUCEDRAMUS OLIVACEUS** GIRAUD.
Olive-headed Warbler.
- DENDRÆCA OCCIDENTALIS** (TOWNS.) BAIRD.
Hermit Warbler.
- DENDRÆCA TOWNSENDII** (NUTT.) BAIRD.
Townsend's Warbler.
- DENDRÆCA KIRTLANDI** BAIRD.
Kirtland's Warbler.
- DENDRÆCA GRACIÆ** COUES.
Grace's Warbler.
- DENDRÆCA NIGRESCENS** (TOWNS.) BAIRD.
Black-throated Gray Warbler.
- DENDRÆCA DOMINICA ALBILORA** BAIRD.
White-browed Yellow-throated Warbler.

OPORORNIS AGILIS (WILS.) BAIRD.

Connecticut Warbler.

CARDELLINA RUBRIFRONS (GIRAUD) SCL.

Red-faced Warbler.

SETOPHAGA MINIATA SWAINS.

Red-bellied Redstart.

ERGATICUS RUBER (SWAINS.) BAIRD.

Red Warbler.

BASILEUTERUS CULICIVORUS (LIGHT.) BONAP.

Brasher's Warbler.

BASILEUTERUS BELLI (GIRAUD) SCL.

Bell's Warbler.

VIREO VICINIOR COUES.

Gray Vireo.

VIREOSYLVA AGILIS FLAVO-VIRIDIS (CASS.) R.

Yellow-green Vireo.

VIREOSYLVA PHILADELPHICA CASS.

Philadelphia Vireo.

HESPERIPHONA VESPERTINA (COOPER) BP.

Evening Grosbeak.

PYRRHULA CASSINI BAIRD.

Alaskan Bullfinch.

ÆGIOTHUS BREWSTERI RIDGW.

Brewster's Linnet.

PASSERCULUS PRINCEPS MAYNARD.

Ipswich Sparrow.

PASSERCULUS GUTTATUS LAWR.

Saint Lucas Sparrow.

PASSERCULUS ROSTRATUS (CASS.) BAIRD.

Large-Billed Sparrow.

COTURNICULUS LECONTEI (AUD.) BP.

Leconte's Sparrow.

AMMODROMUS NIGRESCENS RIDGW.

Black-and-white Seaside Finch.

ZONOTRICHIA QUERULA (NUTT.) GAMB.

Harris's Sparrow.

SPIZELLA ATRIGULARIS (CABAN.) BD.

Black-chinned Sparrow.

PASSERELLA ILIACA UNALASCENSIS (GM.) R.

Townsend's Sparrow.

PASSERINA VERSICOLOR (BONAP.) GRAY.

Varied Bunting.

SPIZA TOWNSENDI (AUD.) RIDGW.

Townsend's Bunting.

PSILORHINUS MORIO (WAGL.) GRAY.

Brown Jay.

MYIOZETETES TEXENSIS (GIRAUD) SCL.

Giraud's Flycatcher.

MYIODYNASTES LUTEIVENTRIS BONAP.

Henshaw's Flycatcher.

EMPIDONAX FULVIFRONS (GIRAUD) SCL.

Fulvous Flycatcher.

CONTOPUS PERTINAX CABAN.

Coues's Flycatcher.

ORNITHION IMBERBE (SCL.) COUES.

Small-billed Flycatcher.

PACHYRHAMPHUS MAJOR (BONAP.) SCL.

Thick-billed Flycatcher.

HADROSTOMUS AGLAIÆ (LAFR.) CAB.

Rose-throated Flycatcher.

CYPSELOIDES NIGER BOREALIS (KEN.) RIDGW.

Black Swift.

- TROGON AMBIGUUS** GOULD.
Coppery-tailed Trogon.
- ACTODROMAS COOPERI** (BAIRD) COUES.
Cooper's Sandpiper.
- PELIDNA ALPINA AMERICANA** CASS.
Red-backed Sandpiper.
- HETEROSCELUS INCANUS** (GMEL.) COUES.
Wandering Tattler.
- DENDROCYCNA FULVA** (GMEL.) BURM.
Fulvous Tree Duck.
- CAMPTOLÆMUS LABRADORIUS** (GMEL.) GRAY.
Labrador Duck.
- PHALACROCORAX MEXICANUS** (BRANDT) S. AND S.
Mexican Cormorant.
- PHALACROCORAX PENICILLATUS** (BR'DT) HEERM.
Brandt's Cormorant.
- PHALACROCORAX PERSPICILLATUS** PALL.
Pallas's Cormorant.
- RHODOSTETHIA ROSEA** (MACGILL.) BRUCH.
Ross's Gull.
- STERNA ELEGANS** GAMB.
Elegant Tern.
- STERNA TRUDEAUI** AUD.
Trudeau's Tern.
- STERNA ANÆSTHETA** SCOP
Bridled Tern.
- OSSIFRAGA GIGANTEA** (GM) REICH.
Giant Fulmar.
- PRIOCELLA TENUIROSTRIS** (AUD.) RIDGW.
Slender-billed Fulmar.

- PRIOFINUS MELANURUS** (BONN.) RIDGW.
Black-tailed Shearwater.
- PUFFINUS KUHLI** (BOIE) BP.
Cinereous Shearwater.
- PUFFINUS MAJOR** FABER.
Greater Shearwater.
- PUFFINUS CREATOPUS** COUES.
Pink-footed Shearwater.
- PUFFINUS GRISEUS** (GM.) FINSCH.
Dark-bodied Shearwater.
- PUFFINUS TENUIROSTRIS** TEMM.
Slender-billed Shearwater.
- CESTRELATA HÆSITATA** (TEMM.) COUES.
Black-capped Petrel.
- HALOCYPTENA MICROSONA** COUES.
Least Petrel.
- CYMOCHOREA MELÆNA** (BP.) COUES.
Black Petrel.
- OCEANODROMA HORNBYI** (GRAY) BP.
Hornby's Petrel.
- FREGETTA GRALLARIA** (VIEILL.) BP.
White-bellied Petrel.
- SYMORHYNCHUS PYGMÆUS** (GMEL.) RIDGW.
Whiskered Auk.
- SYNTHLIBORHAMPHUS WURMIZUSUME** COUES.
Temminck's Guillemot.
- BRACHYRHAMPHUS MARMORATUS** (GM.) BRANDT.
Marbled Guillemot.
- BRACHYRAMPHUS KITTLITZI** BRANDT.
Kittlitz's Guillemot.
- BRACHYRHAMPHUS HYPOLEUCUS** XANTUS.
Xantus's Guillemot.

In respect to the manner and place of breeding of many other species we have only partial and highly unsatisfactory information. Dozens of land birds might be mentioned—for instance, the kinglets, western titmice, most of the warblers, the western tanagers, *Leucosticte* finches, western crows and jays, *Empidonax* flycatchers, and so on—as coming into this category; while it must include almost all of the birds whose home is in the swamps and marshes.

“A little knowledge is a dangerous thing,” says the poet, and it has proved so I fear, in this case, since we have long been beguiled into contentment with partial and fragmentary accounts, instead of working out the whole body of facts which are needed to make the breeding history of each bird completely understood.

This ignorance of the nesting habits of water birds is, in most cases, far less excusable than in the other instances mentioned above, since they are not uncommon and often breed numerously not far from our homes, as for examples, the bitterns and several species of familiar plovers and rails. Their summer abodes, however, are hidden in the depths of a morass, or other watery space hard of access, and it requires the urging of strong ambition and the great patience of a real student to ascertain all the facts in

respect to them. But this difficulty ought not to be a sufficient excuse for ignorance, and if it could be proved to have been accepted as such in any instance, ornithology would be disgraced just so far. If the facts and the specimens of oölogy are not worth the expense of hard work, personal discomfort, and even some danger, then the sooner we forsake our pretensions the better.



BIRD ARCHITECTURE.



IV.

BIRD ARCHITECTURE.

A DEFICIENCY IN FACTS.

CERTAIN classes of data are needed in respect to all our birds,—even the commonest,—relating to their breeding season. Among these may be suggested memoranda through successive seasons and at various localities, of the dates when nest-building is first begun by every species brought under observation. Out of such memoranda would grow a better knowledge than we now hold of how far differences of latitude, altitude or other physical situations, and the conditions of weather (as a late or an early spring) affect the breeding habits of the bird. Much, perhaps, is asserted in regard to all these points in our books, but little is actually known and guaranteed.

Then there is the enquiry into the diversity observable in the method of nest-building and in the use of material. An example of this variability has

already been alluded to in the case of Traill's fly-catcher (pages 26-29), but another instance may not be out of place, as showing how such variations may exist and long remain undiscovered.

There is no bird perhaps, whose nest has seemed more uniform in its adherence to the accepted type of structure in every respect, than the orchard oriole (*Icterus spurius*). It covers a wide extent of territory in its habitat, ranging from the Connecticut river to the Rocky mountains and from Lake Superior to Texas. The ordinary style of its nest, which may be accepted as typical, is that described so carefully by Wilson, who unravelled from one of them a single fibre of grass thirteen inches long, which had been passed back and forth through the wall of the nest no less than thirty-five times. Sometimes these pensile nests, after the manner of the Baltimore oriole's, are hung among the pendent tips of the drooping branches of a willow or elm, several of which may be woven into the sides and serve as upright ribs or stays. These nests are likely to be the most deep and neatly made of any to be found. But a favorite situation is in an apple or pear tree, and here the nest is suspended by the brim, between the prongs of a fork, like a vireo's and is more cup-shaped and shallow. In both cases the walls are rather thin (particularly in those made at the south,

where a circulation of air is so desirable), and the appearance of the nest is likely to be rather shaggy outside, though smooth within; but having at the same time a new clean look about it, different from the domicile of almost every other bird.

With singular uniformity, the material everywhere employed is a yellowish green grass (*Poa* only?), often with the ripe blossomed heads left on, which is woven and interwoven "as if done with a needle." In some cases there is a scanty lining of thistle, cottonwood, cat-tail and ferns, wool, downy breast-feathers of ducks, etc., forming a mat at the bottom. About the nest the leaves are arranged artfully—I use the word advisedly—to conceal the sitter, and shield her from sun and rain.

Such is the nest of this oriole as ordinarily presented to view. All writers agree in regard to it, and Samuels alone hints at any other than a more or less perfectly pendulous nest. It appears, however, that another style has been adopted in some parts of the country by the orchard orioles, which have totally abandoned the pensile idea.

In Trenton, N. J., on Prospect Farm, the charming country-house of Dr. C. C. Abbott, I saw these orioles nesting in a group of pines in front of the house, and also among the scraggy twigs of a buttonwood, occupying the far ends of the large upper limbs, as

they had done for years, and here as elsewhere their sociability was manifested, several pairs living harmoniously as close neighbors. These nests are not at all pensile, being supported in the midst of a cluster of twigs and resting upon the branch. They are formed with care out of the long flexible grasses which are used in the pendulous structures, but skillfully intermixed with it are many pine needles, an ingredient which would hardly answer in the other form. Dr. Abbott says that this is the prevailing style through all the pine regions of southern New Jersey. On the other hand, in Bergen county, Mr. A. I. Huyler assures me that the orchard orioles, although they do not make pensile homes, never fix upon a pine branch as a position, but inhabit the fruit trees exclusively, making a nest of interwoven grass, without pine needles, supported in the midst of a clump of apple-twigs to which it is strongly bound. Never, to Mr. Huyler's knowledge — which is trustworthy and extensive — do the orioles in his region use the same nest twice; whereas at Trenton not only do they return to the same ancestral tree season after season, but always tear the old nests to pieces with amusing vehemence to obtain material for the construction of the new, which are occasionally erected upon the foundations of a previous structure.

QUESTIONS UPON INCUBATION.

The precise period of sitting in various species is recorded in only a few instances, and ought to be observed with care, together with an attempt to ascertain what vicissitudes of weather and neglect the eggs are able to survive, whether such misfortunes shorten or prolong the time of sitting, and whether the eggs of different species vary in respect to hardihood.

Whether there is, or is not, a regular relation between the size of the bird and the length of the incubation necessary to hatching; or, between the character and locality of the nest or any other outward circumstances and the same period, might be brought out by a series of such observations, and would prove an important addition to ornithological lore, tending to make clearer the influences which act for and against the perpetuation or welfare of a species. Perhaps, also, it will aid us to answer the question why one species, which to all appearances has as fair a chance in life as another similar one, should be so much less numerous in representative individuals than its fellow. For example, why should a great disparity in numbers exist between the yellow-rumped warbler (*Dendroæca coronata*) and its

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close kin the cærulean (*Dendræca cærulea*) or Kirtland's (*Dendræca kirtlandi*) warblers? Many influences combine, no doubt, to effect this disparity: but an investigation of the comparative endurance of the eggs might go far toward solving the problem.

FLEDGLING DAYS.

Another step toward light upon the reason for the excessive rarity or abundance of any species in a fauna, compared with accompanying species which seem to have an equally good, or no better, chance, would be to acquire a more accurate knowledge of the care of the young by the old birds in various species; the changes of temperature or other vicissitudes which the fledglings are able to endure—among the water birds and some others, they seem about as tough as the adults—and the food which it is needful they should have.¹

A single example will suffice to call attention to the kind of influence I mean.

Assuming as a fact that the yellowbird (*Chrysomitris tristis*) invariably laid its first eggs at a very late

¹ So far as this point is concerned almost the first systematic observations are now being carried on by Professor S. A. Forbes of Normal, Illinois; and the thanks of all ornithologists are due to him.

day in the summer—after nearly all its companions were done with domestic cares, in fact—it was early alleged by writers that this eccentricity was owing to lack of proper food for the young yellowbirds previous to that time. Long ago, Mr. Augustus Fowler, a keen observer who lives near Danvers, Massachusetts, wrote to Wilson Flagg: "The cause of this delay is, that they would be unable to find in the spring those milky seeds which are the necessary food for their young." And on page 90, of his *Birds of Florida*, Mr. Maynard says: "I have always found this species feeding exclusively upon seeds, and as they cannot find sufficient of this food earlier in the season, breed late." Now I must confess to having fewer actual facts to oppose to this theory—while putting small faith in it—than I ought to have; and I quote it here as an example of my own and others' ignorance in regard to a perfectly familiar and always accessible bird,—ignorance which sharp-sighted oölogists ought speedily to clear up.

So far as records exist, they show that the date of egg-laying is highly variable. It seems to occur most early (as in the case of all transcontinental species) on the southern Pacific coast, where the time is late in May; at Sacramento and in Utah early in June, at Philadelphia "generally from the 10th to 15th June" (Gentry): at Trenton, N. J., Dr. C. C. Ab-

bott's note-books record eggs taken all the way from May 17 to August 3; in Massachusetts, dates are given from June 10 onward, while in Maine, July is considered the nesting month of this species, and in Michigan dates range from May to September.

It is evident, then, that although the goldfinch breeds late, as a rule, yet sometimes it nestles quite as early as the majority of the woodland birds. That the same individuals may, and do, vary greatly in the time of this function from year to year, I have no doubt; why—is just the point we want to have cleared up.

The evidence also seems to show that they have the power of retaining their eggs, or, rather of repressing their desire to lay, to a much greater extent than is generally supposed possible with birds. This is shown not only by the long delays which have been known to take place in their nest-building, followed by a successful *finale*, but also from the fact that specimens dissected in April show an equal readiness and development of ovaries and testes with those shot late in the summer. It is unscientific to say that nothing more rational than caprice can be assigned as the cause of this anomalous habit in breeding: but it seems to me equally a confession of unworthy ignorance to allege scarcity of proper food for the young as an explanation; this inadequacy is

emphasized by the fact that the other species of the same genus nestle as early in the season as any of the *Fringillidæ*; and, in the case of the pine-finch, a good deal earlier.

APPLICATIONS FOR FACTS.

The importance of the gathering of all these facts, of course, lies in the use we are able to make of them for the general advancement of science. If the breeding habits of birds form the most noteworthy phase of their existence, and oölogy is, as I hold, an integral part of ornithology, then all its facts have an ulterior bearing and application to questions of the history and economy of bird-life just as much as the facts and statistics of geographical distribution, migration or food,—and even more. And if they have this bearing upon the elucidation of the history of birds, they also necessarily reach farther, and materially aid the progress of insight into the intricacies of animal life generally, and so advance not only ornithology alone, but zoölogy, biology in general and finally the whole of human learning.

It is perfectly fair to look at our investigations in this large way, and the education of our minds to do so dignifies our work, enlarges the conception of its

scope and usefulness, prompts a hundred suggestions which form a scaffolding on which to build further researches, and stimulates to new and untiring exertions.



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